No. 1602
Vol. XLVI

FLIGHT

and

AIRCRAFT ENGINEER

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OFFICIAL ORGAN OF THE ROYAL AERO CLUB

AUGUST 10th, 194

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SQUADRON FLEW BACK TO SAVE ITS CHIEF

SQUADRON-LEADER JACK CHARLES, the D.F.C. fighter pilot who recently shot down the 1,000th enemy plane for Biggin Hill station, has since been rescued from the sea by brother officers.

He had been on a sortie over Holland. When the squadron returned to base and heard he was missing they refuelled, re-armed and set out to search for him across the North Sea.

Base signalled

They found him, writes the Sunday Express Air Reporter, in his dinghy, 20 miles off the Dutch coast. One pilot signalled base, which immediately reported his position to the R.A.F. Air-Sea Rescue Service.

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Soon Squadron-Leader Charles, with one of the Luftwaffe pilots, was picked up by a high-speed launch and rushed back to England, escorted all the way by the rest of his squadron.

They landed at base with petrol tanks almost dry.

From the Sunday Express, August 6.

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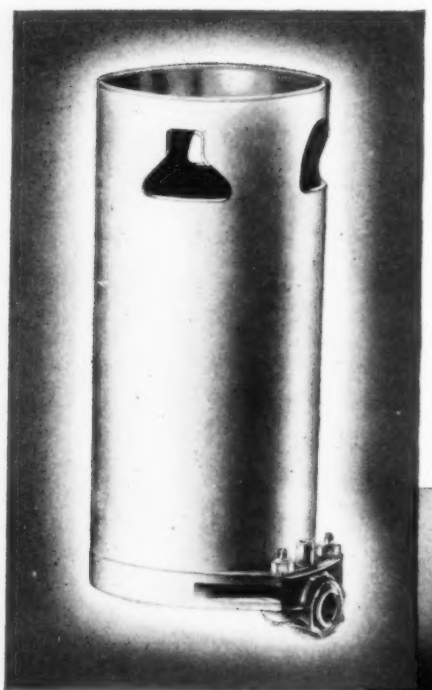

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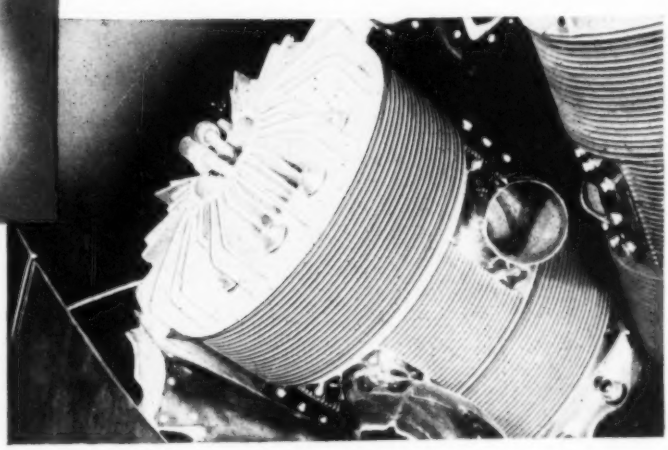

This is the first of a series of twelve advertisements prepared for retention, and constitutes a simple story of sleeve-valve advantages.

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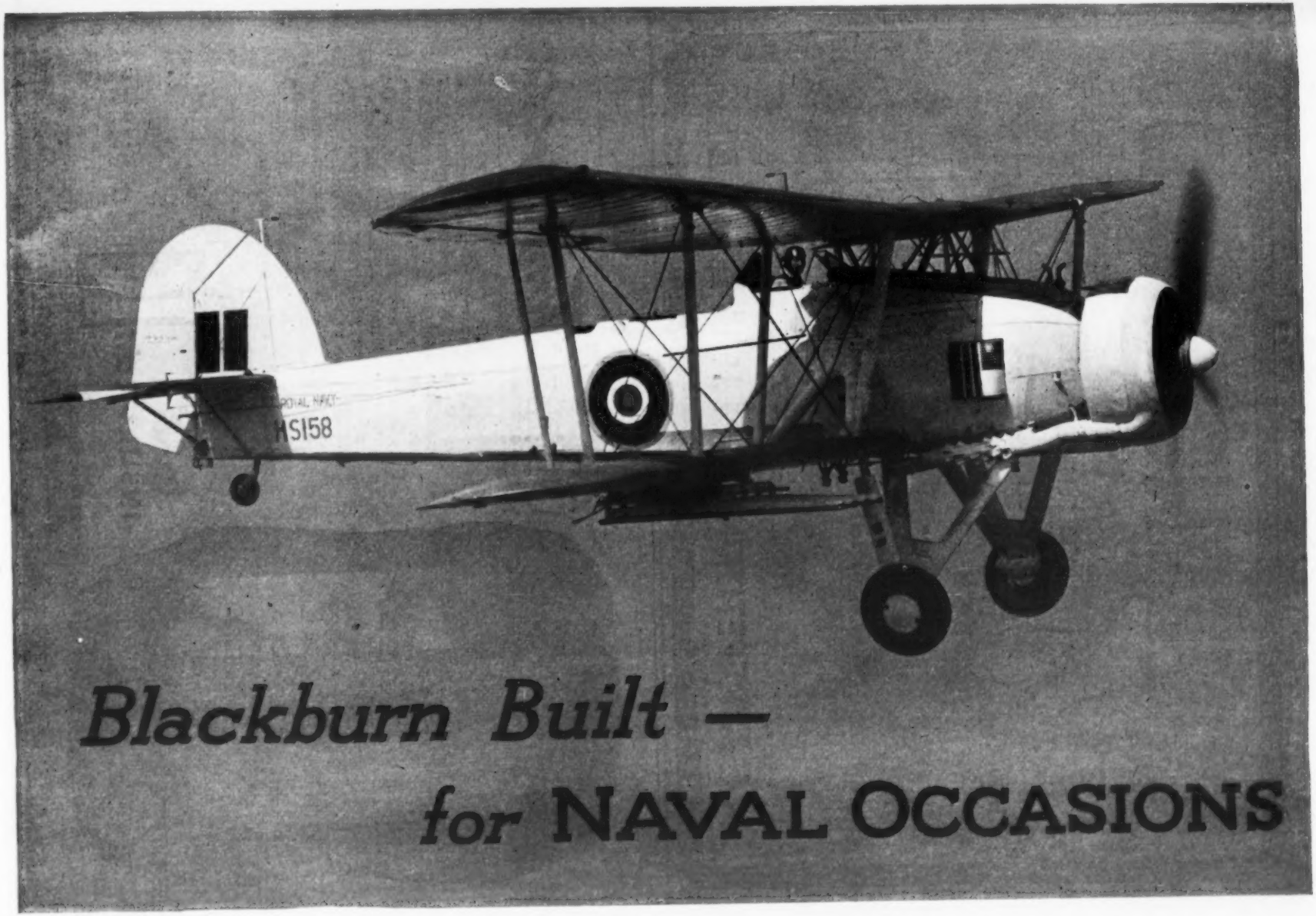
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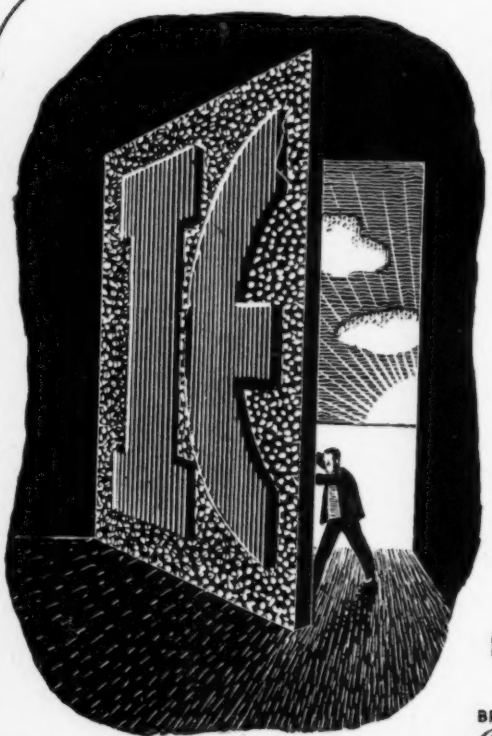

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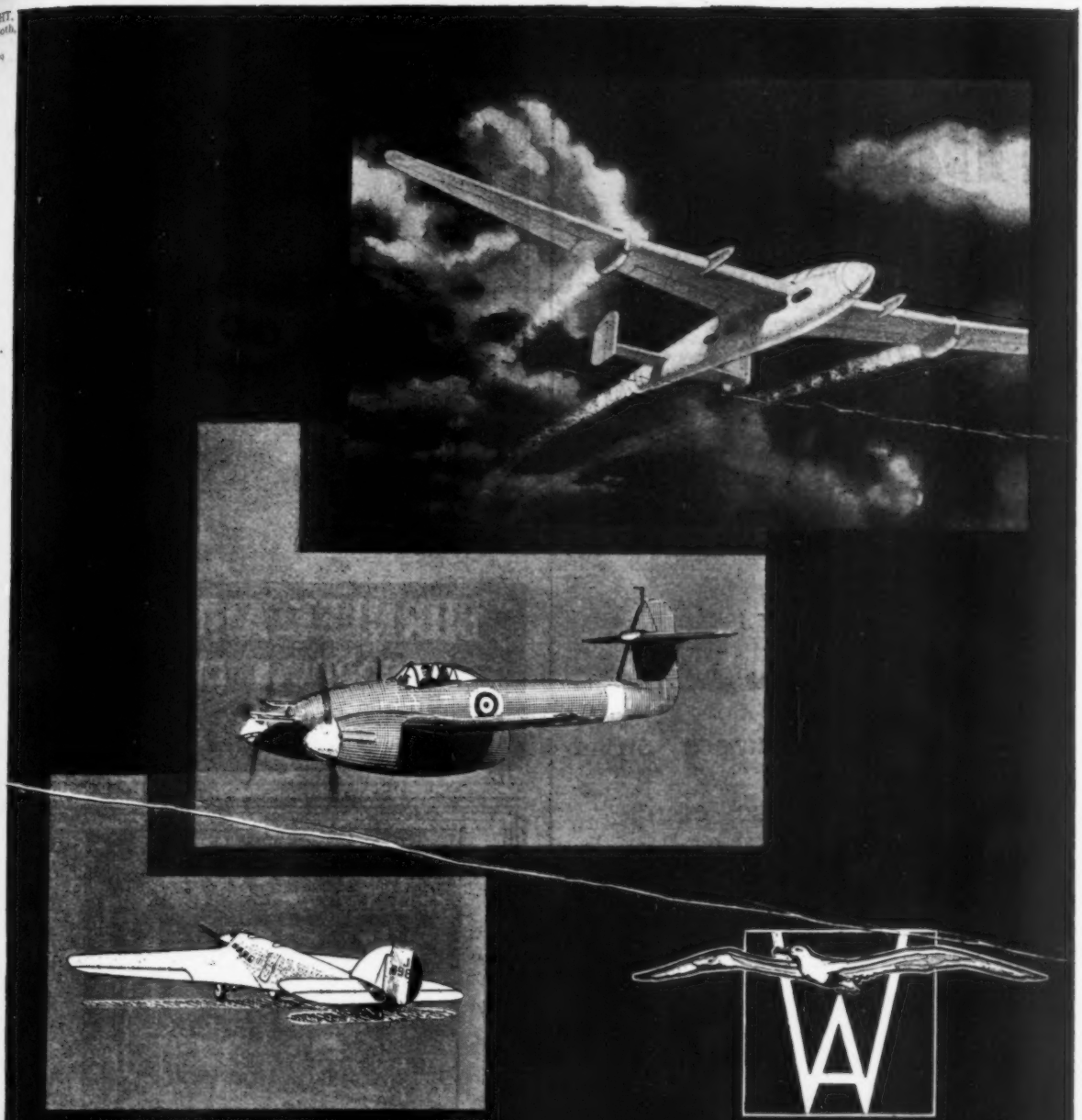

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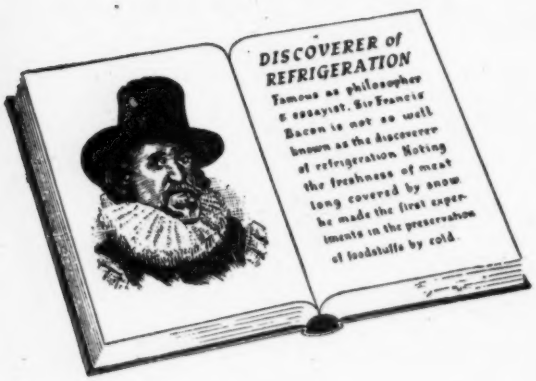
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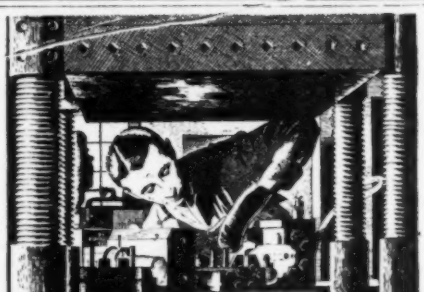

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The Outlook

The Official Mind

EVER since September, 1939, we have endeavoured to follow the workings of the Official Mind. There have been times when we thought that we were making some headway, and that we could detect glimmerings of logic behind apparently futile regulations and obstructions. But usually these periods were short-lived, and some new aspect of censorial sensitivity made us realise that we were as far as ever from understanding the Official Mind.

In recent weeks one of our chief pre-occupations has been the air torpedo, flying bomb, doodle-bug, or whichever Fleet Street name is finally going to stick to Göring's *Ersatz Luftwaffe*. We were not a little surprised when, almost as soon as the attacks had started, the Air Ministry rushed into print with a hand-out drawing which, quick frankly, we found unconvincing in several details.

Since that time we have endeavoured, so far without success, to obtain official permission to inspect one of these missiles with a view to publishing a detailed illustrated description by men who thoroughly understand the subject of jet propulsion. We have been held off with vague statements about "Our (M.A.P.) experts are hard at work studying them." People in the aircraft industry have seen them. Their secrets are quite well known, but officialdom cannot be moved.

If the reason had been that it is not desired to let the enemy know how much British authorities know, we should have sensed some sort of logic in the Official Mind, even if we could not share it. But the drawing originally issued seems to have disposed of that argument.

Then along comes the Ministry of Home Security with a statement about how the flying bombs behave. To our simple mind it seems that there could be little harm in describing one of his weapons and giving details which the enemy already knows. What he does not know, and what he would obviously very much like to know, is how the air torpedoes behave when they get here. And the Ministry of Home Security obliges by telling him quite a bit about that. Truly the workings of the Official Mind are obscure.

Air Power in the Offensive

WHEN August opened its account with a true summer day of the sort for which all Britons have been longing since the fading away of spring, it was noticeable that the heavy bombers of General Carl Spaatz's 8th Air Force devoted most of their attention to enemy airfields in France.

The *Luftwaffe* has shown up so little since the Allied landings in Normandy that this may have caused some surprise. The lesson was learnt, at the time when the bombing offensive was the only major activity which the Allies were able to undertake against the Reich, that it is not enough to destroy a target such as a factory. Watch has to be kept on the repair activities of the persistent Germans; and after a certain amount of repair work has been done it is necessary to send bombers over the same place again to reduce it to the desired degree of inutility.

Of late the *Luftwaffe* has borne every appearance of being a product which has been reduced to uselessness for all practical purposes; nevertheless the Germans may attempt to revive it, and therefore occasional bombing visits to their airfields are desirable. It is hard to believe that all the effort which not long ago was put into the manufacture of aircraft has lately been diverted to the production of air torpedoes and

(possibly) rocket shells. The long-drawn slaughter of German fighters and the methodical bombing of fighter factories is the more probable explanation of the present position. Without fighters, of course, the *Luftwaffe* is ineffective.

With the disappearance of German fighters there has been the concomitant phenomenon of heavy bombers playing a tactical part in land battles, and not only American heavies (which were designed for day work), but also British Lancasters, Halifaxes, and even the time-honoured Stirlings, have taken part in this work. Most astonishing of all, the heavy bombers have been used in Normandy to attack German positions which were within range of the Allied artillery. The latter have even used smoke shells to indicate the target to the aircrews. That the bombers should try to pulverise back areas beyond the reach of the guns would seem natural; but to use bombs as an alternative to shells is a novelty, which, we had reason to believe, was not considered orthodox in the highest Allied military circles. Perhaps the explanation is that suggested in *Flight* a week or two ago; namely, that shells have to be brought to France by sea transport, while the bombers bring their own missiles with them, and so save shipping space by the use of air transport.

"Sublime!"

IN his review of the war situation last week the Prime Minister, as is his usual custom, paid a tribute to the Royal Air Force and its partner, the United States Army Air Forces.

This tribute was on quite different lines from those in his previous speeches. No longer did he deal with the prospects of strategic bombing directed against the enemy's warlike production. This time he spoke only of the contribution which air power had made in paving the way for the landing in Normandy. Whether this series of operations should be classed as strategic action or as major tactics we leave to others to decide. It certainly was the modern equivalent of what used to be called artillery preparation in the days when battles seldom lasted for more than a single day.

The result of this preliminary bombardment from the air was that when our ships crossed the Channel on D-day, half the guns which were to have blown them out of the water were already dismantled or silent.

The price paid was that between April 1st and June 6th over 7,000 men of the R.A.F. from the Home Command was killed or missing, which was a higher proportion of casualties than what was suffered by either of the other two Services. The U.S. losses in the air were also very heavy, and Mr. Churchill summarised the result with the words: "The devotion of the pilots and aircrews of both countries was sublime."

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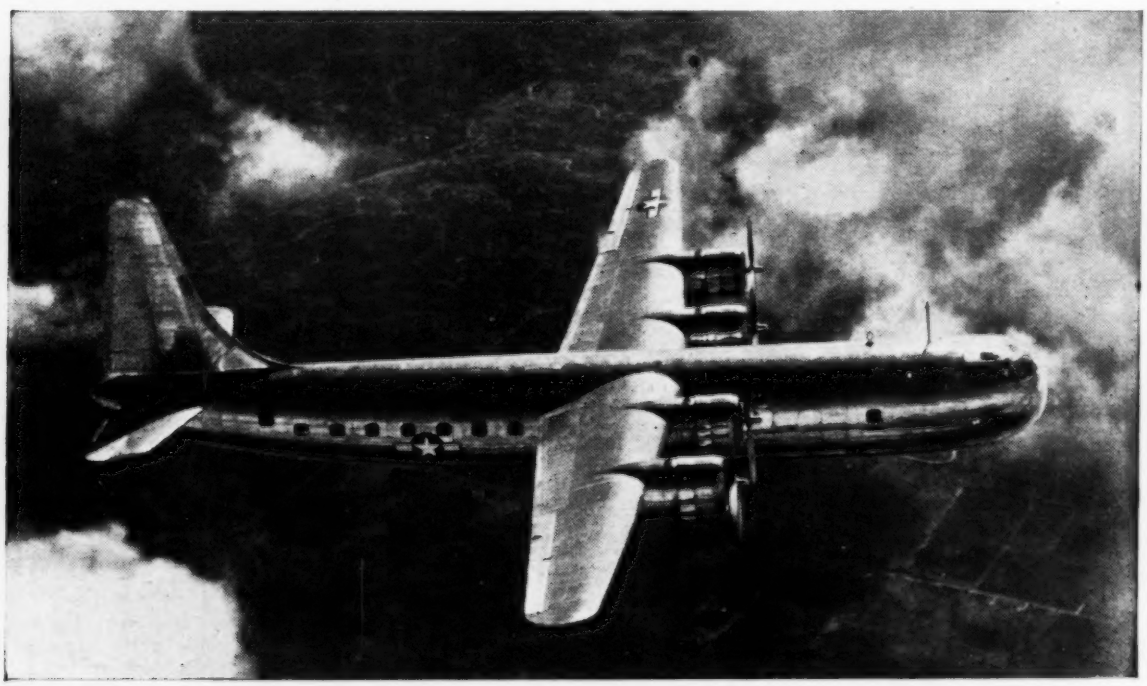
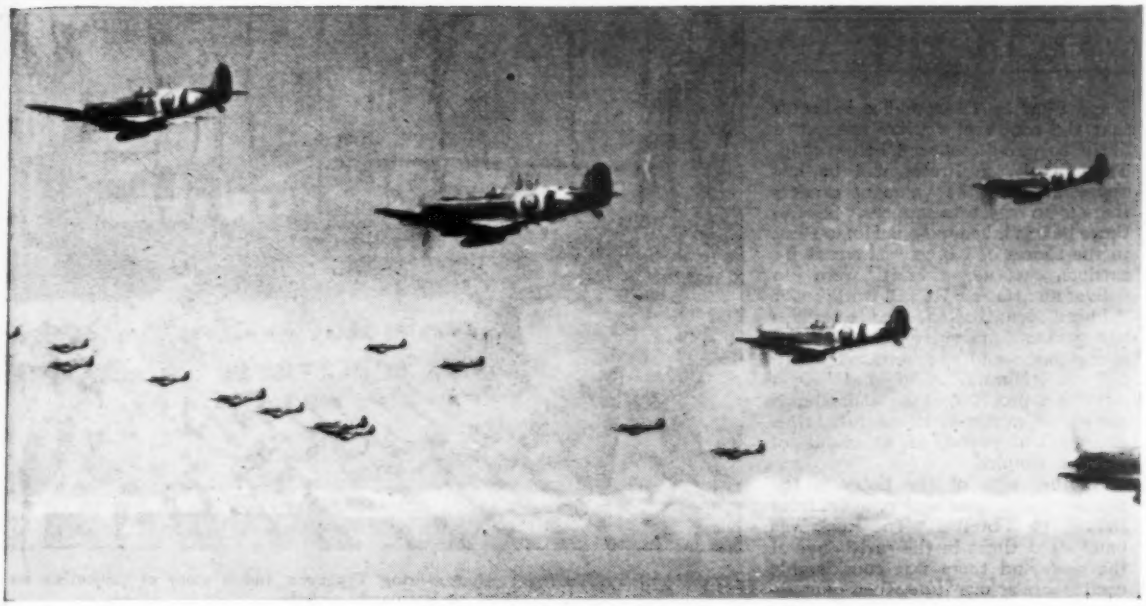


LIBERATOR LINER: First picture of the new civil version of the Consolidated Vultee bomber conversion. With a total weight of 56,000 lb. it will carry 48 daytime passengers or 24 as a sleeper. Wing, power plant and undercarriage are those of the standard Liberator. Engines: Four Pratt and Whitney of 1,100 h.p. each. The single fin and rudder are also fitted on some of the later Liberator bombers.



BACK ON THE CONTINENT: A Norwegian Spitfire squadron of A.E.A.F. which has operated from Normandy since the first air strip was laid down.

WAR in the AIR

Naval Air Power to the Fore : R.A.F. Busy in Bad Weather : Advance in Normandy : Turkey and Germany

IN the days when the Fascisti of Mussolini still proclaimed that the Mediterranean was *Mare nostrum*, the aircraft carriers of the British Mediterranean Fleet first proved their value. The Italians had never built carriers, trusting that shore-based aircraft, with plenty of bases, could dominate the whole of that sea; but Admirals Cunningham and Somerville showed that with even a small supply of carriers convoys could be run through to Malta. It was Admiral Somerville who said that when he had not got the *Ark Royal* with him he felt like a blind man without his dog.

It seems certain, however, that the Pacific is destined to be the ocean in which the carrier will attain its greatest height of glory. Carriers were the craft which delivered the treacherous blow at Pearl Harbour. It was the complete absence of carriers which caused the loss of H.M.S. *Prince of Wales* and *Repulse*. It was a carrier which launched the first bombing attack on Japan. In all the recent advances by the Americans and Australians from Port Moresby up to the Caroline Islands carriers have played a leading part, and in some great battles all the fighting on the American side was done by aircraft off their carriers.

It is, therefore, highly significant that Admiral Sir Bruce Fraser has been transferred from command of the Home Fleet to that of the Eastern Fleet. Sir James Somerville has been in command at Trincomallee for some time past, and he is an experienced and redoubtable fighting Admiral. But he is older than Sir Bruce Fraser, and has been in command of fleets for a good long time. He may well welcome a less strenuous post. The Commander-in-Chief of the Home Fleet (with the sinking of the *Scharnhorst* to his credit) must be regarded as our best active Admiral for the time being. That he should be transferred from

RAISING THE WIND: Re-arming a Typhoon with 1,000 lb. bombs in the wing racks. If ceiling permits, they are released on the target during a 70 degree high-speed dive.

WAR IN THE AIR

Scapa Flow to Trincomallee indicates that the centre of warlike interest is likely to move eastward before long. That Sir Bruce Fraser will be less appreciative of the value of carriers there is no reason to suppose. Several times he has taken out the Home Fleet to the shores of Norway as escort for carriers, whose aircraft were to deliver an attack. He will work under Admiral Mountbatten, who is perhaps our greatest authority on combined operations, and in concert with Admiral Nimitz, who has given numerous proofs that he understands the use of carrier-borne aircraft in his attacks on island after island of Japan's Empire.

Another sign of the times is the return of instalments of refugees from Britain to Gibraltar. The Rock was bombed at times in the early days of the war, and there was considerable excitement at one time when guns on the Spanish mainland were observed to have Gibraltar within easy range. Now all such dangers are past, and it is time for the evacuees to go home. They will probably not feel any acute regrets at saying good-bye to the English summer of 1944. Many British sun-lovers would be only too pleased to go with them. Our only regret is that some few of them fell victims to air torpedoes during the last month of their stay in Southern England. That was a sorry ending to four years of exile from their native Rock.

July Summary

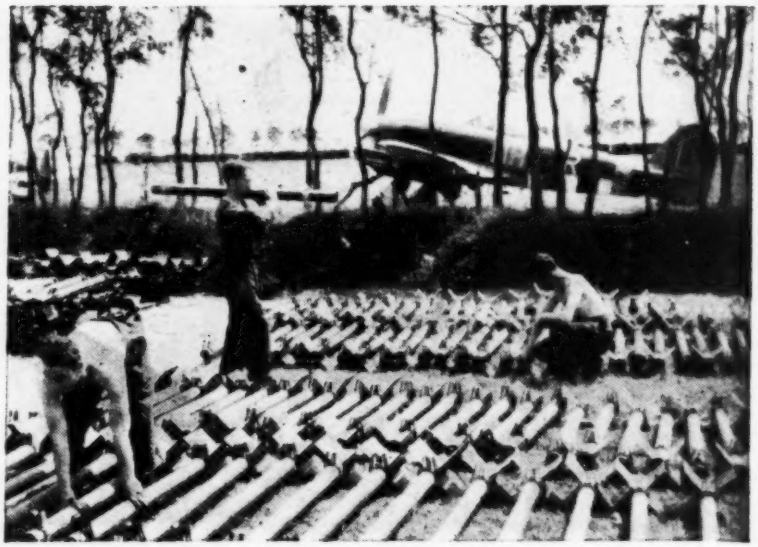
DURING July, a month in which cloudy weather was a considerable handicap to flying operations, the work of A.D.G.B. was more varied than that of any other R.A.F. Command. Those who supposed that the squadrons of A.D.G.B. would do nothing but defend Great Britain were wrong. For one thing, there were no attacks on Great Britain by enemy aircraft during the month. In place of them came the air torpedoes, and dealing with them was the chief occupation of the fighter squadrons of the Command, together with the A.A. guns and the balloons. No figures have been published of the number of air torpedoes destroyed; but people who live on the routes which these missiles mostly follow are eloquent in their descriptions of the number of noisy crashes which go on round them and also of the terrific clamour of the gun barrage.

In addition to this work, A.D.G.B. has joined with the 2nd Tactical Air Force in providing cover by day and night for our troops in Normandy and for supplies being shipped across the Channel.

Transport Command has put up the fine record of having evacuated 10,000 casualties since D. Day from France to England, and not one of its aircraft suffered a mishap in the process. Not a single wounded man died on the way while being flown across. During July the Command carried round about 550 tons of raw material, medical supplies, and food to France, in addition to nearly 1,000 medical and fighting personnel.

These are a few salient features of the report for the month. The aggressive spirit of the R.A.F. is reflected in the tale of casualties of aircraft. In offensive action over Europe (excluding the Normandy battlefield), the R.A.F. losses were 221 machines against 51 enemy aircraft destroyed (over Britain the enemy lost three machines, evidently engaged on reconnaissance). In Italy the results were more favourable; namely, 475 Allied aircraft lost, against 658 of the Axis. The Middle East, which is now the least active front, lost ten and bagged five. The S.E. Asia Command has announced 20 aircraft losses and claimed 12 Japanese machines shot down. The monsoon weather probably had something to do with these last figures. The Allies have been doing more flying than the Japanese have ventured to do.

One good piece of work done by Allied aircraft in Normandy was to give Marshal Rommel a bad headache—a literal headache. The British belief was that he was knocked unconscious in an air raid on one of the German headquarters, but we had rather hoped that our bombing of several of these headquarters would have produced more drastic effects



NORMAN PASTORAL: Rocket-firing Typhoons and a store of projectiles on a Normandy airfield.

MACHINE-MADE WAR: The barrage from semi-automatic guns attacking the completely automatic air torpedoes as they fly over Southern England.

WAR IN THE AIR

than mere concussion. The Germans say that Rommel met with a car accident as a result of an air raid, and they may be telling the truth for once. Both versions agree that aircraft were responsible. Congratulations to Sir Trafford Leigh-Mallory! Concussion is not likely to make Rommel's brain any more wily in its efforts to counter the manœuvres of Gen. Montgomery. Rommel is a clever soldier, but Montgomery has always beaten him. The odds on Sir Bernard are longer now.

Turkey

TURKEY and Russia are old opponents. They were old opponents at the time of the Crimean War and at the time of the "Jingo" song. In the early days of this war a correspondent who knew Turkey wrote that if it were a simple quarrel between Germany and Russia, Turkish sympathies would certainly be on the German side. But Turkey had made a treaty with Britain, and the Turks are a nation which stands by its word. So they remained benevolently neutral. No doubt the German campaign in Greece brought it home to the Turks that their Army was deficient in modern weapons, and was really in no condition to stand up to German Panzer divisions.

Now, however, that those formidable German armies are manifestly beaten on all sides, Turkey has broken off diplomatic relations with Germany. Presumably that will mean that the Allies will be able to use naval bases and airfields in Asia Minor for operations against the Germans in the Ægean Sea. That should help towards the liberation of Greece. The faction fights among Greek parties have somewhat sullied the fair fame of the nation; but they have not obliterated the memory of the heroic stand which the Greek Army made against the legions of Mussolini. The Greeks have suffered horribly at German hands, and the number of deaths from starvation has been appalling. To set that gallant country free is very near to Britain's heart. Turkey, too, looks forward to working with Greece in setting up a Balkan federation which should help to secure lasting peace in one of the most troubled areas of Europe.

TANKS FOR THE BUGGY RIDE : Sqn. Ldr. T. F. Kyle driving a captured German robot beetle tank out of which the explosive charge has been removed and a seat installed.

German Oil Supplies

THE blockade enforced by the Royal Navy seldom gets much credit until a war is over, and in this war the task of the Navy has been more difficult than it was in the last. The Ministry of Economic Warfare has stated that since the entry of Russia into the war no oil supplies have reached Germany by evading the blockade or through neutral sources. The limited stocks in existence have had to be drawn upon recently to meet the deficiency caused by Allied bombing on current output. The enemy has suffered a substantial loss as a result of the bombing of his storage tanks, dumps and tank-cars in transit, and there is no doubt that for months past Germany's war effort has been handicapped by lack of oil.

Everyone has noticed the attention which Allied bombers, both from Britain and from the Mediterranean, have recently been paying to Ploesti, to Leuna, and to other important centres. The Navy and Air Forces have worked together to some effect.

FROM OUR OWN CORRESPONDENT AT S.H.A.E.F.

A HIGH-RANKING officer of the U.S.A.A.F. who had taken a hand in planning the operation and who had also been an eye witness of the American break-through west of St. Lo described to correspondents the general layout of the attack. The best way of describing it is to liken it to the growing point of a plant which pushes through the crust of earth and then fans out while the inside of the bud grows on. In actual terms, the infantry pushed through a soft gap made by the air forces and held this funnel-shaped area while further infantry and a force of armour passed through to the enemy back areas.

The jumping-off point was a length of some five miles of the straight St. Lo-Perier road, which formed a bold and easily found bomb-line for the air forces to work to. The American troops were withdrawn some 1,500 yards and, 80 minutes before H. hour, the ball opened with seven groups, each of 36 fighter-bombers, dropping a load of fragmentation and 500-lb. general-purpose bombs. These were followed by 1,508 heavies, which took an hour to drop their load. As a final attention to the break-through area—to destroy in detail what the mediums and heavies had missed—eight groups of fighter-bombers made low-flying attacks.

The time which must always elapse between the last bomber going home and the troops advancing into the cleared area, covered by an artillery barrage, is always a critical period. To prevent the enemy moving up any immediate reserves to fill the gap, the medium bombers of the 9th U.S.A.A.F. put in a further 45 minutes' bombing of the roads just south of the area.

Bombs for the Gap

The bomb figures are interesting; altogether 2,423 aircraft dropped 61,951 bombs of a total weight of 4,302 tons. These bombs varied from the 500-lb. instantaneous-fused H.E. bombs to the tiny, but very effective, 23-lb. fragmentation bomb. For the area covered, the attack worked out to an intensity of 10 bombs per acre. It is not surprising that most of the prisoners taken from this area were "bomb happy." As is almost inevitable in such circumstances, there were a few "shorts" which fell behind the American lines. These, however, were not due to a miscalculation in navigation, but to a material failure in one of the leading Marauders of a formation.

To prevent a repetition of the armour and infantry being held up by concealed screens of anti-tank and machine guns, the tanks had been fitted with radio sets. These enabled the tanks to make direct requests to aircraft for specified targets to be hit.

A close-up of these operations as seen by a fighter-bomber pilot was also given at headquarters by Maj. R. W. La Roque, who commands a Thunder-

WAR IN THE AIR

bolt squadron of the 9th U.S.A.A.F. He described the sense of responsibility which the pilots have for the lives of the ground troops. The weather was so bad during the opening stages of the attack that his P47 had to come down as low as 400ft. to engage the enemy. This he thought was "pretty rotten," but then, as he said, it was also pretty rotten for the chaps on the ground. The Thunderbolts were carrying two 1,000-lb. bombs on the day of the breakthrough, but after the Germans had got on the move—as he said, "not in the direction of victory"—fragmentation bombs were used again.

The Thunderbolt pilots prefer precision dive-bombing to either shallow-dive, low-level or skip-bombing. When the ceiling allows, the pilots go into a very steep dive at 12,000ft., whistle earthwards at about 500 m.p.h. and release their bombs at about 3,000ft. The ordinary gun sight is used for aiming, and a very high degree of accuracy is claimed. Maj. La Roque says that a direct hit is guaranteed, provided the exact position of the target and the strength and direction of the wind are known.

Evasive action is taken as the Thunderbolts peel off—or pay out, as the Americans call it—before entering into the straight dive. This effectively puts the German gunners off their aim, and the speed which is attained in the dive makes the P47 very difficult to hit.

Shell Shortage

While on the subject of flak, it is significant, I think, that from several sources lately I have heard the opinion expressed that the Germans are short of A.A. shells in Normandy. This shortage is showing itself in that only vital areas are being protected, but at the same time the quality of the shooting indicates that only the best gunners have been retained. It looks very much as if strategic bombing of factories and transport is paying yet another dividend.

When Major La Roque was asked how much he sees of Field Marshal Sperrle's *Luftlotte III* while flying over Normandy, he said that during 84 missions since D-day he had only seen two enemy aircraft. His squadron was too busy helping the ground soldier to worry about searching for the *Luftwaffe*. Next to no enemy aircraft puts in an appearance during the hours of daylight, and even at night it is seldom that more than 70 or 80 are in operation. In the first 52 nights since the invasion, no fewer than 110 of this weak effort had been destroyed by our night fighters over the beachhead.

When it is remembered that Sperrle has only some 500 single-engined fighters, 450 twin-engined fighters, and about 400 heavy bombers and anti-shipping-aircraft to cover the whole of France, Belgium, Holland and N.W. Germany, it is not surprising that a shortage is evident. What *is* difficult to understand is the almost complete absence of reconnaissance machines over the areas where they would be expected to operate at all costs. Truly the German soldier has been let down completely by his air force, which, according to very reliable reports, cannot maintain even such small numbers of aircraft as are now being operated. While commanding the Condor Legion in Spain during the civil war, Sperrle was responsible for the destruction of Guernica, and the killing of 20,000 civilians in thirty minutes in Rotterdam was another example of his generalship. How are the mighty fallen!

Airborne Tanks

This air supremacy over the battle-field pays a big dividend and is cumulative in its effects. With no air opposition the Allies are now able to have "grasshoppers" working with the tanks to spot for them and prevent them from running into screens of concealed anti-tank weapons or other ambushes. The air weapon is also being used very effectively to kill counter-attacks before they reach dangerous proportions. It was revealed last week that the tanks which were carried in Hamilcar gliders by the Sixth Airborne Division were of American design and manufacture, but used only by the British. These little tanks weigh 7 tons each and mount an offensive armament of one 37 mm. cannon and two rifle-calibre machine guns. What probably surprised the Germans more than these tanks were the 17-pounder anti-tank guns, which gave such a good account of themselves in the early stages of the invasion.

Paratroop Clerics

To be dropped over enemy territory on an inky-black night, even if one is armed to the teeth, requires courage of a very high order. To be a paratroop chaplain and make the jump unarmed, except for a bible, a hymn-book and a miniature communion set, requires the same courage plus a faith found in but few men. Capt. G. B. Wood, one of the thirteen U.S. paratroop chaplains who dropped in Normandy, described his work with an enthusiasm and fervour which showed his keen appreciation of things spiritual and material as related to men living close to violent death. His work, he said, lay in helping to give the men courage for the ordeal ahead of them, and to comfort the wounded and dying. Capt. Wood also jumped at the invasion of Sicily and at Salerno. His comment on the dangers of parachuting was: For the first and second jump you just follow instructions, and it seems easy. On the third drop the hazards become very apparent, but by the time seven or eight jumps have been made the confidence of experience has been gained.

Nursing Orderlies

Another job which requires courage of the same high standard is that of nursing orderly on the transport aircraft which take supplies over to France and bring back wounded men. L/ACW Venter, who has been doing this work since D-day, was introduced to H.Q. correspondents, and she described some of her experiences. These transports do not bear any Red Cross markings, and the freight on the outward journey often includes high explosives. On the return trip 18 wounded cases are carried in the Dakotas. No other medical staff are in the aircraft, and the responsibility of giving emergency treatment to serious cases lies with the orderlies. Normally they do at least one journey a week, and each round journey, from take-off in England to touch-down again, takes about four and a quarter hours. Flying pay at the rate of eightpence a day is allowed. Over 10,000 wounded men have been brought back by air since the invasion started.

R.A.F. Regiment

Grp. Capt. C. W. Mayhew bore a slight grin on his face as he told correspondents that the airfield protection gunners of the R.A.F. Regiment have not yet been accused of firing on our own aircraft.

The R.A.F. Regiment does a much bigger job than is generally realised. They deal with mines and booby traps on captured airfields, with pockets of resistance left behind by the enemy, and they provide protection for special intelligence officers who go ahead to capture targets of particular importance. One of their jobs is to officer and n.c.o. the Iraq Levies; another is to instruct the R.A.F. in the use of small arms. They once took over part of the front line in Italy to relieve the Army for a while. In Normandy, up to D+56 they had shot down 21 enemy aircraft and damaged a further 24. Both armoured and rifle squadrons have been formed.

Born within the past five years, it is difficult to realise that the regiment were ever armed with pikes. Nevertheless, this was so. In most cases the pikes were made in squadron workshops, and many must be still in existence. The days following Dunkirk now seem a very long way back. In those days the regiment with its pikes was very much on the defensive. Nowadays, in like manner to all our other arms, it is on the offensive.

The B-29

Novel Features of the Superfortress Tested on Reduced Scale on Fortresses : Ordered "Off the Drawing Board" : Success a Splendid Memorial to Edmund T. Allen

AS THE JAPS SAW THEM : Two Superfortresses of the type which bombed the Japanese island of Kyushu on June 15th.

FURTHER interesting particulars of the inception and evolution of the Boeing Superfortress, which was described and illustrated in our issue of July 6th, have now become available. They relate particularly to the vast research undertaken in order to ensure that everything that went into the new type should have been thoroughly tested and tried-out beforehand so that the number of snags brought to light once production had started might be reduced to a minimum. The B-29, it must be remembered, was virtually "ordered off the drawing board."

Conception and History of the Boeing B-29

The story of the development of the Boeing B-29 Superfortress dates back to the winter of 1938, when staff officers of the U.S. Army Air Corps asked the Boeing firm to submit ideas for major modifications of the Flying Fortress, which the Boeing Company had introduced three years before.

At that time the Boeing Company was engaged in improving the design of the Flying Fortress; was manufacturing the Boeing Stratoliner; had just built a larger superbomber, the B-15, for the Army, and had presented to the Army in 1936, 1937 and early 1938 tentative designs for three other large bombers.

The B-15, of which only one was built, had set records for range and load-carrying capacities, but the Army was lukewarm about the machine because it lacked the speed and altitude performance desired. At that time more powerful engines were not available to keep pace with the increase in aircraft size. There had been little response to the other three designs submitted, principally because funds then available for purchase of military aircraft were extremely limited.

Boeing engineers reported that the requested modifications of the Flying Fortress cabin were not practical. But the study of the performance desired opened the way for definite discussions with the Army on the need for a faster bomber with greater altitude, longer range and carrying a much greater military load.

These discussions with the Army began to crystallise in the latter part of 1939, and on January 29th, 1940, Boeing received from the War Department a circular containing general specifications and a request that Boeing bid on an experimental four-engined bomber. This was the opportunity for which Boeing had been waiting four years.

Boeing engineers had already been at work on such a design, and the company's answer to this invitation was the Model 341. This proposed bomber had a gross weight of 73,000 pounds with an alternate gross weight of 85,672 pounds, substantially greater than the Flying Fortress. Described by the late Edmund T. Allen as a cleaner machine (aerodynamically) than ever had been designed and the smallest aircraft capable of very long range, the Model 341 was powered by four engines. It had tricycle landing gear. Sikorsky, Martin, Douglas, Consolidated and Lockheed also submitted designs.

But France and England already had been at war with Germany some ninety days. As a result, the United States Army Air Forces' ideas of aircraft design were changing rapidly. The Army believed that the Model 341 and other designs submitted did not go far enough. The Army wanted an advanced design which, when it finally got into quantity production, would be the best in the world. In February, 1940, 30 days before Hitler invaded the Low Countries—the Army issued a supplement to its specifications, increasing requirements and asking builders to submit new ideas. Most of the other contesants dropped out.

Boeing, however, in March, began enlarging the Model 341 into the Model 345. This also was a four-engine bomber. But its gross weight was increased. Competition was keen and Boeing put into its design every mile of range and speed, every pound of carrying capacity and every foot of ceiling that was possible. The design met

THE B-29

almost instant approval, and on June 1—twenty days after Hitler had invaded the Low Countries—Boeing was authorised to construct wind tunnel models and a mock-up of the slightly revised model known as the XB-29. This was identical to the Model 345 except that gross weight had again been increased.

Wind tunnel tests of the XB-29, conducted at the University of Washington, the California Institute of Technology and the National Advisory Committee for Aeronautics wind tunnels, so impressed the Air Forces that on August 24th, 1940, Boeing was authorised to build three full-sized XB-29 prototypes.

On May 17th, 1941, before the first of these experimental models had been completed in Seattle, the Army had become convinced that the Boeing design would fill a vital role in the nation's aerial offensive strategy and ordered the B-29 into quantity production at the Boeing Wichita plant.

The first flight test was on September 21st with the aircraft in the air for one hour and 15 minutes. Testing continued throughout the rest of 1942, through 1943 and into 1944.

Engineering Achievements in the B-29

When Boeing received the go-ahead signal from the Army on building wind tunnel models of the B-29, the first concern was the development of a wing which would deliver the performance required. The Boeing Aerodynamics Unit for several months had been working on a wing and was pleased with its promise. But the Army was demanding higher speed, longer range and greater overall performance, so development was undertaken on a still newer wing. The result was the Boeing "117" aerofoil, a wing possessing remarkable qualities exceeding those of any previous design.

The "117" offered greater range performance because of refinements in drag characteristics. The Army, however, was uncertain of the wing because of its high loading. This, they feared, would reduce ceiling and affect handling characteristics during take-offs and landings. Boeing argued, and justified its argument, that the desired ceilings could be obtained, and that excellent landing and take-off characteristics would be provided through the use of the Boeing-created flap which would counteract high wing-loading.

Wind tunnel tests verified this position to the satisfaction of the Army representatives, and construction of the three experimental models was ordered.

ROOM FOR STOWAWAYS: The huge fin of the B-29. It was flight-tested on a reduced scale on a Fortress.

Wing Construction

The Boeing "117" wing is of web-type construction rather than the tubular spar construction of the Flying Fortress wing. A heavy extruded duralumin flange was selected for the web spar. Weighing 255 pounds when machined, this flange is said to be the largest extrusion ever used in a production aircraft.

The improved features of the Boeing "117" wings are: Decreased drag per pound of lift; increased thickness of the inter-spar area, permitting greater strength of the primary structure and greater volume in which to carry fuel; better stall warning and more gradual stalling characteristics. As finally developed, the wing has a span of 141.2ft. with an aspect ratio of 11.5. The high aspect ratio results in high wing efficiency because a lower percentage of air loss occurs at the wing tips, and so induced drag is kept low.

The trailing edge is approximately straight except for the portion between the inboard nacelles and the fuselage. The trailing edge of the flap in this portion hooks downward, decreasing aerodynamic interference between the wing and the body, and minimising tail buffeting during climb.

The 4¼-degree dihedral angle of the wing, the 7-degree sweep-back and the large vertical fin make the machine very stable, both in direction and in roll, suppressing any tendency to slip or skid. Any tendency to fall off on one wing during a stall is immediately converted into a bank and then into a glide, straight ahead, a desirable characteristic.

High wing loading requires large wing flap area to reduce the speed of landings and distance of take-offs. The Boeing flap achieves for the B-29 a landing speed the same as that of the Boeing B-17. To decrease the take-off distance and speed, the flaps are extended 25 degrees at take-off. The flaps roll back and down, increasing the wing area and the downwash angle of the air leaving the wing. When the flaps are extended the total wing area is increased 19 per cent.

The Controls

Although, as indicated above, the demand for aerodynamic cleanness was paramount in the development of the Boeing B-29, control and stability were given equal attention. When necessary, sacrifice in performance was made to achieve greater stability, resulting in an aircraft easy to fly and with no undesirable ground or flight characteristics. Control forces are even lighter than in the B-17. Problems of developing control surfaces that would give adequate control and maximum stability for a machine of this size were many. At first it was thought that hydraulic boost of the flight controls would be necessary. However, by continued study and by wind-tunnel tests, and by use of Boeing control tabs, control surfaces were developed that require no more control effort than those on much smaller machines. The result is a simpler, less expensive, less vulnerable and more easily maintained control system than would have been the case with a hydraulic "boost" system, and at the same time one which retains the important pilot "feel" of the controls. Operation of the rudder actually requires less effort than that of the Flying Fortress.

The newly developed ailerons not only are aerodynamically and statically balanced, but also have combination

servo tabs and trim tabs to reduce control effort to a minimum. They provide a much greater rolling response than has characterised previous large aircraft.

The tailplane and elevators are identical in plan-form and size to those used on the present B-17s, although of different section and construction. To prevent stalling the stabiliser at a critical flight attitude, the tailplane section is modified so that the leading edge is turned up, giving the effect of an inverted aerofoil.

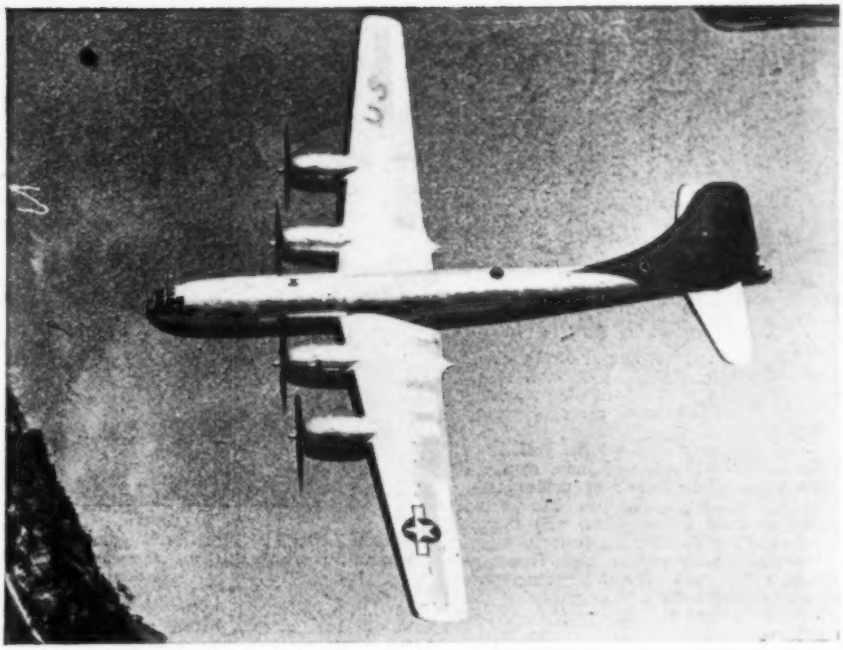
Design of the nacelles of the B-29 involved a long process of aerodynamic evaluation. For their size more air is drawn through B-29 nacelles than any others in existence.

To eliminate a multiplicity of air inlets in the wings it was decided to place one large duct in the nacelle nose. This gave an oval shape to the forward portion of the nacelle.

Aerodynamically the nacelle must be the smallest size possible, to reduce drag to the very minimum. But at the same time the nacelle had to be large enough to accommodate the dual turbo superchargers and the inter-coolers. In addition they had to provide adequate space in which to retract the landing gear, and at the same time to endeavour to provide reasonable accessibility to the nacelles. The nacelle design finally adopted has proved practical for all purposes.

Clay models of nacelles were made for more than a year before the design finally was adopted. This was necessary in order to arrive at a compromise between the demands of the aerodynamics and the structural and mechanical design units of the design departments.

After design of the XB-29 had largely been crystallised, and the Army Mockup Board had approved major aspects of the machines, progressive-thinking military technicians began introducing new ideas on the bomb bay.



ASPECT RATIO 11.5: That is the achievement of Boeing engineers in the Superfortress. Since the span is given as 141.2 ft. the wing area, from span²/area, should be 1,734 sq. ft

Extending the Bomb Bay

As designed originally, the bomb bay would carry a certain amount of bombs, but only in large sizes. If the bomb bay was elongated, which would mean that the aircraft would have to be lengthened, could not additional bombs of smaller size be carried?

Boeing engineers began redesign of the bomb bay, reporting that if 37in. were added to the length of the fuselage, as great a weight in small bombs could be loaded as in large bombs.

The B-29 is equipped with a tricycle landing gear, design of which was a sizeable undertaking. The problem of nose-wheel operation is one of geometry—that of getting the proper relationship of the nose wheel ahead of the main wheels to assure proper steering and handling. Because of the B-29's great weight, a dual nose wheel was essential. Nobody ever had designed a dual nose wheel for an aircraft. Those wheels are of 3ft. diameter. The design was accomplished successfully and provision made for their retraction.

There was another problem of retracting the main gear into the nacelles. Striving for aerodynamic perfection, Boeing engineers wished to retract them completely rather than permit them to protrude slightly as in the case of previous planes. How to squeeze the main wheels, 4ft. 8in. in diameter and with dual tyres, into the nacelles was not an easy problem. Further, to streamline this section completely, doors had to be installed to close behind the wheels.

To test their own theories on design of the nose wheel gear, Boeing engineers first constructed a scaled-down model which was installed on a Douglas A-20 at Wright Field. Trials proved that the gear operated satisfactorily even if one tyre blew out.

The Boeing B-29 Superfortress has been referred to often as the most tested aircraft ever built. This is due to the fact that construction of the experimental B-29s was started before detailed designs were finished and that the enormous bomber was ordered into large-quantity production long before the first XB-29 was completed. Many portions of the control system, including all tail surfaces of the Superfortress, actually were flight-tested before any of the bombers had taken to the air.

In the autumn of 1940, various B-29 control surfaces, scaled to the size of the smaller B-17, were flight tested on a B-17C Flying Fortress which was assigned to this test work. During the next spring, scaled-down B-29 ailerons were tested on the B-17. The object of the latter tests was to develop an aileron which was both lighter in control forces than that of the B-17 and at least 50 per cent. more effective. Later the Army made available a B-17E Fortress on which was tested a scaled model of the B-29 tail surface. These flights confirmed the correctness of the design.

Structural Testing

Structural strength tests began during the time the first XB-29 was taking form. All major components of the airframe, built in full scale and complete form, were tested to destruction to determine beyond any doubt the accuracy of designed strength calculations.

This testing to destruction has three phases: (1) the testing of component parts while the parts are held in special testing jigs, (2) the testing of component parts in relation to others after they have been installed on the airplane, and (3) the testing of the entire airplane. The complete airplane tested is not one of the experimental models but rather the complete airframe without engines or other such equipment. Boeing hastily constructed a special building, which was dubbed "The Cathedral"

(*Concluded on page* 151.)

HERE AND THERE

LARGE LUMPS: These A.A. gunners in Southern England, acting as "pall bearers" to a large piece of air torpedo they have just shot down, look justifiably pleased with their trophy.

Death of F. J. Mortimer

THE death is announced of Mr. F. J. Mortimer, C.B.E., F.R.S.A., Hon.-F.R.P.S., as a result of shock arising from injuries caused through enemy action.

Mr. Mortimer received the C.B.E. in the Birthday Honours of June, 1942, for his magnificent record of achievement in photographic art. He has edited *The Amateur Photographer* and *Photograms of the Year* for nearly forty years. He was past-president and Honorary Fellow of the Royal Photographic Society; organiser and secretary of the London Salon of Photography; president of the Camera Club; Fellow of the Royal Society of Arts. His loss will be felt keenly throughout the photographic world.

S.L.A.E. Meeting

A STEADILY increasing membership was reported at the July meeting of the Society of Licensed Aircraft Engineers, the Council adding that in the near future it should reach a figure which will ensure the Society being acknowledged as truly representative of licensed aircraft engineers throughout the British Isles.

The Council confirmed the sub-committee's recommendation to appoint W. B. Keen & Co., chartered accountants, of 224, Regent Street, London, W.1, as the Society's registrars, and Mr. J. H. Willans was appointed honorary secretary.

Equal Priority for Airliners

THE Government's decision to give equal priority in design and production to civil types of aircraft, except for "certain designated war types of major importance," was announced in the Commons last week by Capt. H. H. Balfour, Under-Secretary for Air, when he replied to demands for a Government statement of policy on civil aviation.

He also told the House that we had "a complete schedule of routes to be run over the world, and that it was hoped to have discussions with the representatives of Russia and other Powers in the near future, preparatory to the international conference which was to be held on a broader basis. Lord Beaverbrook while in Washington was to resume his conversations with Mr. Berle in preparation for the international conference.

QUART IN A PINT POT: A Polish squadron-leader demonstrates, with the help of a flight-sergeant, how he brought back a fellow pilot in his Mustang. Hurricane pilots have rescued comrades by "nursing" them athwart the cockpit with legs dangling outboard.

Reopened

THE regular air service between Rome and Lisbon was reopened last week. The route taken is by way of Gibraltar.

Unique

THE B-29 Boeing Super-Fortress, described elsewhere in this issue, is unique in that it is the first heavy bomber designed originally with a pressure cabin to go into operational service.

Germany has the Ju 86P, of course, but this has only been used for high-altitude reconnaissance, and would not, in any case, be classified as a "heavy."

The B-29 cabin, besides maintaining "normal" atmospheric pressure up to the aircraft's service ceiling of over 40,000ft., provides what the U.S. War Department describes as "an unusual degree of sound-proofing and cabin-heating."

Glass Fuselages Now!

EXPERIMENTS carried out with fuselage panels made of a sandwich of glass-plastic material and balsa showed them to be 50 per cent. stronger than panels of the same design and weight employing balsa wood and metal, and 80 per cent. stronger than balsa wood and plywood.

In each case the balsa wood formed the core between outer skins of the other three materials used.

114, Declared

THE veteran Lancaster, "S for Sugar," the first heavy bomber to score a century in operational sorties against the enemy, has now "declared" with a total of 114.

On her last "op"—an attack on rail-

HERE AND THERE

way yards in Northern France a few days ago—she was attacked by enemy fighters and had to take violent evasive action.

"I thought we had been hit in the starboard wing," said her pilot, F/O. M. G. Johnson, "but afterwards found that the noise was the springing of rivets."

Nevertheless, he went on and bombed the target, took pictures, and returned safely to base. But the damage was so extensive that, in view of her age, it was decided that "S for Sugar" had better close her innings.

Death of a Russian Designer

THE death has been announced of N. M. Polikarpov, one of Russia's leading designers of fighter aircraft, who headed the Chair of Aircraft Designing at the Moscow Aircraft Institute.

The I-15, I-16, Chaika, and U-2 aircraft were among his designs.

U.S. Aircraft for Russia

NEARLY 10,000 aircraft—all combat types—have been supplied to the Red Air Force by the U.S. under Lend-Lease since October, 1941. Approximately half of these have been flown to their destination via Canada to Fairbanks, Alaska, where they were taken over by Russian pilots, many of whom were women.

Doodle Buggies ?

WHEN Mr. Attlee, replying to a question in the Commons last week, said that the possibility of applying the principles of jet-propulsion to road transport would be "borne in mind" by M.A.P. and Power Jets, Ltd., in the research now being carried out by them, Mr. Cocks, a Labour Member, caused laughter when he observed: "Is he aware that there is no general desire to have vehicles careering about the country with red-hot tails?"

The obvious limitations of jet-propulsion rule it out for road vehicles, but the gas-turbine has definite possibilities, and it was probably this phase of the research that Mr. Attlee had in mind.

Pan-American Move

PAN-AMERICAN AIRWAYS has filed an application with C.A.B. to "amend" its Miami-Leopoldville (Belgian Congo) line. The certificate on this route expires on Saturday (August 12th), and the company asks that it be made permanent, be extended to Johannesburg and Capetown, that Lagos be eliminated as an intermediate point, and that the U.S. terminal be switched to New York.

The object of this requested "amendment" to an existing licence is not difficult to appreciate; if the request is granted it will mean that Pan-American has gained a permanent licence to operate a New York-Johannesburg-Capetown service in exchange for its old Miami-Leopoldville line.

Quite an astute swop, in fact!

Comment Unnecessary

NEWS that an air torpedo, apparently aimed at British troops in the Caen section of the Normandy front, had overshot into the German lines prompted Goebbels to deny that the V-1 weapon was being used against the Allied invasion forces, and to give as the reason that the beachhead is too confined a target.

Yet the Germans had claimed a few days earlier that they had so perfected this "secret weapon" that they now proposed to attack specified districts in London—namely, the City, the dock area, and the industrial area to the east.

CONCRETE EVIDENCE: Rockets with warheads of concrete are used by Typhoon pilots to practice aiming this comparatively new weapon. Even without any explosion, the target should provide very definite evidence of hits registered. Note the twin guide rails.

Unfreezing Northern Territory

THE Canadian Government is reported to have made arrangements with the U.S. for the extensive use of five large air bases around Hudson Bay and on Baffin Island, which form convenient air links with Canadian bases at Goose Bay, Labrador, and Mingan.

Parliamentary circles in Canada, the report adds, feel that greater efforts should be made in the future to develop the northern territories, and that these airfields will be of considerable help.

"Whaddya mean—Back a bit? ! !"

Still a Star Performer

JAMES STEWART, the film star, now Lt. Col. James M. Stewart, chief of staff of a Liberator combat wing in Britain, has been awarded the Oak Leaf Cluster to the Distinguished Flying Cross. He already has the Air Medal with one Oak Leaf Cluster.

The new award was for "extraordinary achievement while serving as air commander of heavy bombardment formations on many missions to enemy occupied territory," states the official announcement of the award.

"Cheers, Chaps!"

SIX beer tankards have been presented to No. 277 Squadron of the Air/Sea Rescue Service by Dutch pilots of the Netherlands Mitchell Squadron as a token of gratitude for the rescue of three of their crews from the Channel.

During the little ceremony of handing the tankards to Wing Cdr. Allan Grace, D.F.C., commanding B Flight of the rescue squadron, a phone message was received telling them that two of their members had just been awarded the D.F.C., thus providing a first-class excuse to "christen" the gifts.

Thinking Ahead

NORTHROP AIRCRAFT have plans to convert their P-61 Black Widow night fighter into a post-war transport and passenger aircraft by fitting it with a new fuselage.

With Youngman air brakes, and carrying a 1,750-lb. torpedo, the Barracuda is a formidable opponent in many theatres of war.

Fairey Barracuda

How Aircraft Production Group Scheme has Enabled Schedule to be Met and Even Exceeded

"Parent" and "Daughter" Firms

INCREASING reference to new aircraft carriers in operation with the Allied Fleets has given some indication, by inference, of the great expansion of the Fleet Air Arm. These new ships have required the production of many hundreds of naval aircraft, and, in addition, their equivalent in spares which may, in certain categories, amount to 60 per cent. of complete aircraft output.

Three broad categories of aircraft have been supplied. There are those for immediate operational duty, as borne in the ships at sea and, to a lesser degree, working from land bases over vital sea areas such as the English Channel. Secondly come the squadrons in immediate reserve behind the operational squadrons. These are more than reserves in that some of them are allocated to working-up duty for new types of aircraft which will in time supplant those on active service. Thirdly, there is the wide range of training aircraft required not only for flying and tactical training of naval airmen, but also those on target-towing work for the warships, for land-defence batteries and for merchant service gunners.

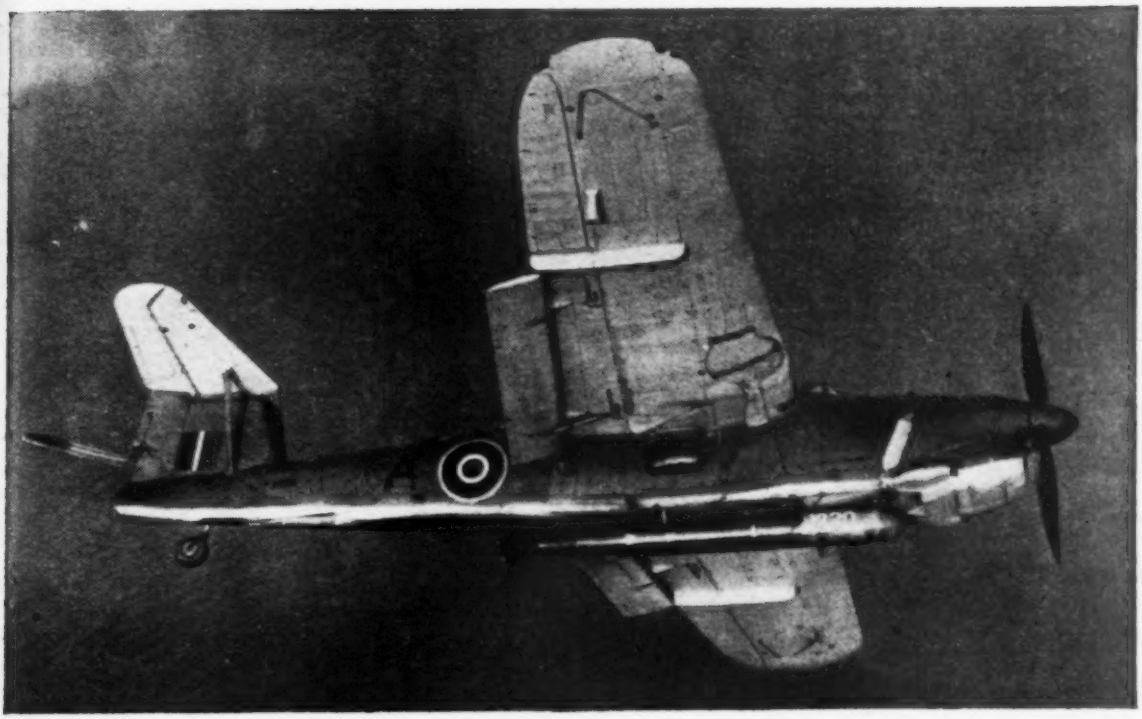
To meet the heavy demands for aircraft arising from these commitments, the system of group manufacture of specialised naval aircraft has been in operation for some time on a similar plan to that so successfully employed with Halifax and Lancaster heavy bomber production. In this connection particular interest centres on the Fairey Barracuda Group, which, it may now be disclosed, is in full production of the Navy's latest torpedo dive-bomber. The Barracuda production unit was initiated by Sir Ernest Lemon in 1942 during his time at the Ministry of Production where he was given the task of co-ordinating and stimulating naval aircraft production to meet the urgent demands of the Admiralty and M.A.P.

The Fairey Aviation Co., Ltd., has specialised in naval requirements for many years, and includes in its history such remarkable aircraft as the Flycatcher, Fairey III.D and III.F, the Seal, the Swordfish and the Fulmar. Under the Group scheme the Fairey company stands as the parent firm to satellite or daughter firms which, in turn, employ the services of hundreds of satellite sub-contractor firms. Originally, three daughter firms were in the Group: (1) Blackburn Aircraft, which had the Swordfish in hand at another of its main factories; (2) Boulton Paul Aircraft, Ltd., which was then tailing off production of the Defiant two-seat fighter; and (3) Westland Aircraft, Ltd., also engaged on twin-engined fighter and single-engined fighter production. At the beginning of 1943 Westland left the Barracuda Group in order to develop another Group engaged on Seafire production. Its subsequent commitments for Barracuda production were taken over by the Blackburn company.

The Fairey company was responsible for design in all its aspects, for initial tooling, and for "scheduling" the job throughout the Group.

Sub-contract Units

Behind the three major units engaged on Barracuda production extended a network of numerous major and minor sub-contract firms producing parts and pieces. Some of these sub-contract units were of great importance in that they undertook production of complete components and of special naval equipment which served the Group as a whole and required no more than installation or assembly on the main production lines. Thus Firm A—which may typify such a concern as Beaton's or Accles and Pollock—stood as a sub-contractor to Fairey's, Blackburn's and Boulton Paul, and part of the Group's directive work was to organise and "channel" production from such a key



The Youngman flaps on the Barracuda can be set at different angles for take-off, landing and dive-bombing. The tailplane is set high to get it out of the downwash.

sub-contract firm to the major units according to demands. This may sound simple, and is on paper, but the war conditions of transport and the wide geographical separation of the numerous firms whose output had to be co-ordinated to that of the main units made it, in fact, a most complex matter to ensure an even flow of completed aircraft from the production lines. Harmonious liaison work between the firms and the M.A.P. organisations accepting their output was highly necessary, since the Barracuda, which at the time had not been in action, was not in the first instance viewed as a vital warplane by many of the workers, who could not know its purpose and the Staff plans for its use.

Each of the daughter firms has a permanent representative at the parent firm's factory to keep the production engineers fully advised of developments and to pass on technical and other information as it becomes available. Meetings of the Group members are held regularly to discuss and agree action on materials, supplies, tooling, modifications, shortages of "embodiment loan" equipment and other subjects.

The requirements of versatility in the Barracuda satisfied operational planning but caused many intricate production problems. The prototype first flew 3½ years ago, but then experience with naval torpedo bombers was confined to the Swordfish and Albacore, both of them biplanes designed by Fairey's. The Barracuda was the first British naval monoplane aircraft to be built and go into service in this war, and its teething troubles were many. Nevertheless, the first deck trials were a source of gratification. Not only was the question of deck alighting at issue, but, with heavy wing loading and comparatively heavy power loading, ability to take off with full warload,

With flaps and arrester hook down, a Barracuda lands-on. It is also equipped for catapult launching.

FAIREY BARRACUDA

including crew and a 1,750 lb. torpedo, from the carrier deck was a problem. Nevertheless, these trials were successful, and equally successful catapult trials followed.

The Barracuda production group, now in full swing, is meeting in full the demands for a world-wide distribution. Production is up to schedule, and in some cases well ahead. Particular attention has had to be paid to spares, since a carrier on departing from home waters goes to sea as nearly as possible a self-supporting and self-contained unit. Thus a ship with hangar accommodation for no more than, say, 30 aircraft may well carry in its spares compartments some 20 further aircraft and engines in component parts, ready for assembly later, when necessary.

In this connection it may well be borne in mind, in considering provisioning difficulties, that ship-borne naval aircraft are required to operate in extremes of climate at short notice, a factor not affecting land-based operational squadrons of the R.A.F., which may be in cold, tropical or temperate zones, but never in all three at brief intervals. Thus, if high tribute is due to the organisers of Group production, an equal tribute should go to the Director of Stores, Admiralty, whose responsibility it is to undertake the provision of some 17,000 parts and pieces which go to make up the Barracuda, only 30 of which may be considered major components, such as wings, undercarriage, ailerons, flaps and tail units.

Post-war Private Aircraft

Surplus Machines Should be Returned to Parent Manufacturers for Reconditioning : No Glut Likely

By H. BEST-DEVEREUX*

THE points raised in Commander Alan Goodfellow's article in *Flight* of July 20th, on the subject of post-war private aircraft, are most timely. The fact that the Air Ministry has not made any statement up to the present that it either encourages or discourages private flying and club flying should cause no undue alarm for the future. The flying clubs and private owners were here pre-war, and if the enthusiasm of this sporting community was anything to go by they will be here after the war in greater strength. Many who before the war knew nothing of aviation are now confirmed enthusiasts, and will require facilities, apart from any provision of reservist flying, to use aircraft for business or pleasure.

It should not be generally assumed, however, that the supply of light and medium types available as surplus to R.A.F. requirements will be unduly large. The Allied Forces will definitely need liaison aircraft in some numbers in connection with policing and occupation on the Continent. This use will preclude many light aircraft from being "bowler-hatted" at any time of their useful life. Naturally the R.A.F. will require a large amount of the spares available for these types. It would, therefore, appear that parent manufacturers will need to continue with the manufacture of spares, even if on a reduced scale.

Condition of Aircraft

The R.A.F. will wish to retain the pick of the aircraft for their needs. Therefore, from the surplus available many will in large part be ready for the scrap heap. The wartime rigours of picketing and hard work under trying conditions will have left many machines far below any possible peacetime standards. The Proctors in Trinidad, which after long service with the F.A.A. required 1,000 yards take-off, are but one, admittedly extreme, example of aircraft in a condition unsuitable for sale to private users.

The following remarks (on the disposal of surplus aircraft) are in agreement with Commander Goodfellow, and are intended to enlarge on his suggestion that parent manufacturers should have priority purchase terms on their own types. They would be the best judges of the course to be followed by each component part when surveyed. The manufacturers, in possession of all the necessary jigs, test rigs and tools, and with many of their inspectional staff skilled in the particular types, would be able to sift the wheat from the chaff to limits and conditions laid down by the governing technical body, presumably the A.R.B. or a similar organisation. From this reduction to spares an assembly line could be laid down and aircraft turned out at a reasonable speed by operatives knowing the type and working with new or repaired and reconditioned components.

The incorporation of modifications for civil use would ensure that by the time the aircraft was flight-tested it would be for all practical purposes new and not in any way a converted throw-out. The purchaser would then be in the fortunate position of paying a reasonable price for a good aircraft, which in turn would repay the vendors when the new and later aircraft were produced, since a large potential market for the future would be formed. The cheaper price should make for a healthy export trade, particularly in the Commonwealth, although we must avoid the crippling cost of shipping and duties which, in many cases before the war, almost doubled the cost of a light aircraft. At the same time American types were available at a reasonable price at destination. This unfair imposition should be remedied in order that manufacturers would have a fair chance of building up necessary overseas connections.

The possibility, though seemingly remote, of any manufacturer having no wish to be burdened with a batch of light aircraft would afford little or no difficulty in the general plan of making aircraft available. There are several smaller firms who, both prior to and during the war, have operated repair and overhaul organisations with success. Their staffs of pre-war engineers were highly skilled on most models of light and medium types. A batch of Magisters, Tigers, Oxfords, etc., would afford them no difficulties. The enthusiast who prefers something a little out of the ordinary would find plenty of opportunity for having a custom-built aircraft produced by a smaller company for competitions, special flights or other purposes.

Careful Inspection

From the technical point of view it will be essential that the surveying inspectors should know their job thoroughly and have a wide experience of the types involved. The many snags and idiosyncrasies of even a light aircraft should be at their finger-tips in order that expensive mistakes in the form of hidden trouble should be avoided. Corrosion and the effect of weather will require real understanding. Spars and main structural members will need some check of their history in many cases, due to wartime concessions to splice up these members in several pieces. It would be quite useless to replace a section of spar if the new splice were to fall too close to a manufacturers' splice which is not visible. This difficulty would necessitate

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POST-WAR PRIVATE AIRCRAFT

search into the manufacturers' archives to discover components in which advantage had been taken of the concessions.

A brief summary of probable types available suggests that there are two American machines likely to find part of the market. These are the Fairchild Argus and the Piper Cub. The first has been used in numbers by A.T.A. for some time, and is by now well modified to British requirements. The difficulty of obtaining engine spares could be overcome by fitting a Gipsy in place of the present engine; the author has, in fact, carried out some preliminary work on this project. The Piper Cub should assist many who require very cheap and occasional flying, but the fact that it is non-aerobatic would detract from its appeal.

The available British types should prove basically satisfactory for the majority of purposes to which they will be applied. The Tiger Moth, Magister, and Auster are already proven as excellent trainers, and clubs should require no great refinement to the general layout of these three types. A *de luxe* Auster with the present rear vision feature retained would provide a handy little touring aircraft for those requiring something more than the strictly utilitarian finish of the average trainer cockpit.

In the larger class the Dominie is easily convertible back to its pre-war rôle without difficulty, the only alteration being the internal furnishings. The Ansons and Oxfords will require a larger amount of work to bring them into line. The removal of all military items of equipment makes the interior of the Anson very suitable for light cargo and ferrying on such as the Isle of Wight and Bristol Channel services, where the "greenhouse" windows would appeal to passengers who, in most cases, would be new to air travel. The cabin of the Oxford does not lend itself at present to a particularly attractive seating arrangement, due to the top skin of the centre section being continuous. To surmount this difficulty it would be necessary to skin the bottom of the centre section and remove the top skin in the cabin. The resulting well would then be suitable for the fitting of seats in addition to seats aft of the rear spar.

For the private owner or light taxi service the Proctor will, of course, prove invaluable in that it is a cabin aircraft. With peacetime fittings and upholstery it should prove a satisfactory interim aircraft for the *grande tourisme* type of flying which appeals to the more expensively-minded private owner or club member.

From the foregoing it is apparent that the post-war private aviator will find much in the way of types to satisfy him. These types, however, can do no more than provide for a short period of years until the new types are forthcoming. These types should be produced as quickly as possible, since other countries will not say "After you, Claude," with overseas markets.

The B-29

(*Concluded from page 145*)

because of its size and shape, for these structural tests of the B-29.

Tail surfaces were tested first and other structures followed. In tests of the wings after they were installed on the fuselage section, it was necessary to apply more than 300,000 pounds of pressure to these surfaces. A complicated system of hydraulic jacks saved a tremendous amount of labour and provided more accurate application of loads.

A major test of the complete airframe was the drop test. The Army stipulated that the aircraft must withstand a free drop of 27in. The big bomber, with weight inside to simulate full equipment, bomb, fuel, crew and ammunition load, was raised 27in. from the floor and then dropped. The Superfortress went through two of these drops, one in a horizontal position and one in an inclined position.

In another test, different sections of a B-29 were riddled by 20 mm. cannon shells and machine-gun bullets to determine the ability of the bomber to withstand gunfire.

The first XB-29 was given its maiden flight on September 21st, soaring into the air with the late Edmund T. Allen, Boeing director of flight and aerodynamics, at the controls. Wellwood E. Beall, vice-president in charge of engineering, telegraphed simply but enthusiastically in his progress report to Washington, D.C., that night:—

"Eddie Allen reports that we have an excellent airplane."

This was the start of a long and arduous test-flight programme which expanded as the B-29 production programme expanded. It was a case of ironing out every possible "bug" before the bomber went into action, for there was no time to wait for the results of battle experience.

Only flight tests can give the final answers to many questions raised by the designers. Moreover, the B-29 included many items of equipment never previously used, which had to be proved in flight.

Allen evolved an order of tests for both the stripped aircraft and the completely equipped machine. He listed items to be tested and how the tests were to be run. That programme, with additions, is still being carried out.

Instrumentation plays a great part in test flights. Manometers register pressures in air ducts and over wings. Potentiometers record temperatures at numerous points through the power plants. Flowmeters show flow of fuel. A photo recorder makes a record of instrument data.

While instrumentation is important and essential in flight testing, it is secondary to the human element—the test pilots, the flight engineers and other trained technicians who make the flights. Each is dependent upon the other and a proper correlation between the two is imperative.

Boeing had a highly developed Flight Test and Aerodynamic Research Unit with such a correlation when the flight test programme for the B-29 started under Allen's direction.

Testing was pushed as rapidly as possible but never was speed placed paramount to thoroughness or accuracy. In a flight-test policy given to pilots and flight engineers, Allen said:—

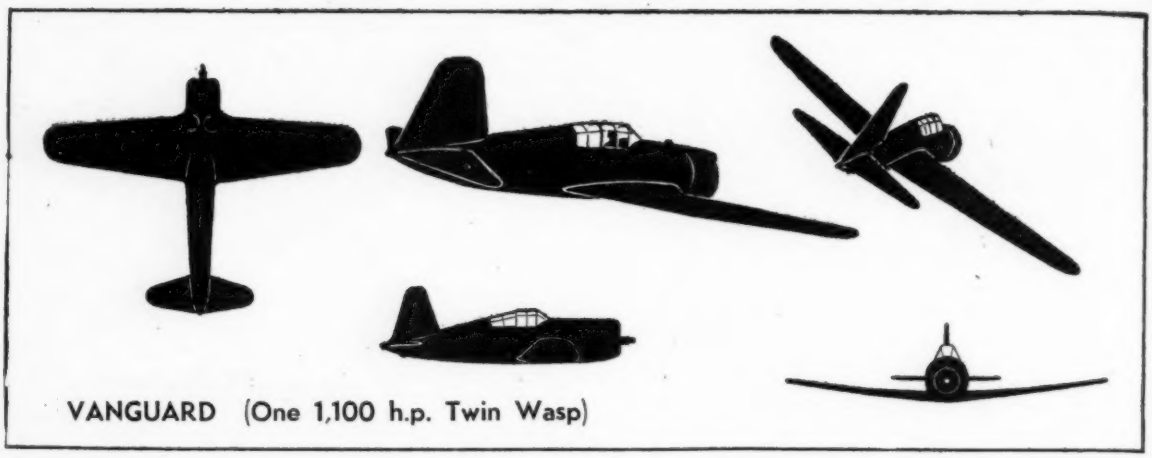
"Patience is one of the prime requisites of a good flight-test pilot or engineer. Some of the less experienced persons engaged in flight test work find it difficult to understand why such pains are required. They feel it should be quite possible to go out and get data with much less bother."

This patience in Boeing flight testing of the B-29 has been carried through from the very start. The test programme continues to-day with Allen's creed still the watchword.

SPIDER'S STING: This latest picture of the Northrop (P-61) Black Widow night fighter shows the armament mounted on the belly. Other guns are probably fitted in the nose.

Studies in Recognition

Aircraft in Fi



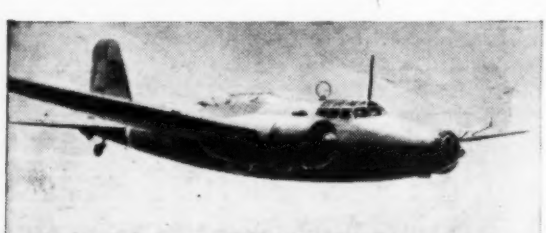
VANGUARD (One 1,100 h.p. Twin Wasp)

WITH a top speed of 350 m.p.h. at only 15,100ft., the performance of the Vultee Vanguard was hardly up to *requirements* even in 1941 when the R.A.F. acquired a few examples originally ordered by Sweden. It had, however, no fewer than ten machine guns—unusually heavy armament for an American fighter at that time—and no doubt the Chinese Air Force, which took over the balance of the Swedish order, found them very useful. The engine is a 1,100 h.p. Pratt and Whitney Twin Wasp with two-speed supercharger.

The low wings taper moderately on both edges from the roots to round tips, the tailplane has more pronounced taper, and the tall, angular fin and rudder is set ahead of the horizontal surfaces, the whole rudder surface being above the pointed tail of the typically American fuselage. Dimensions: Span 36ft., length 28ft., height 9ft. 5in., wing area 197 sq. ft.

Vultee Vanguard Fighter.

MITSUBISHI OB-97 (Two 870 h.p. Kinsei)

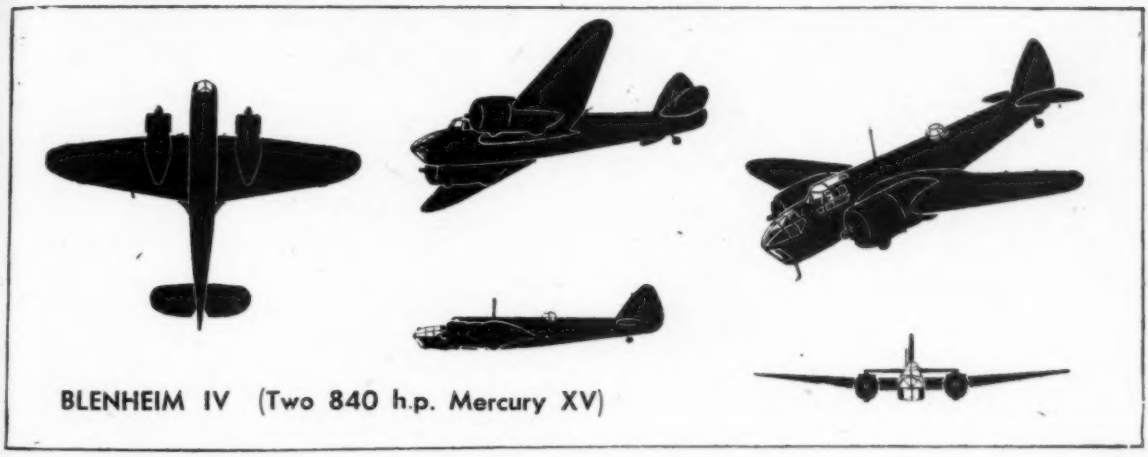


Mitsubishi OB-97 Bomber/Transport.

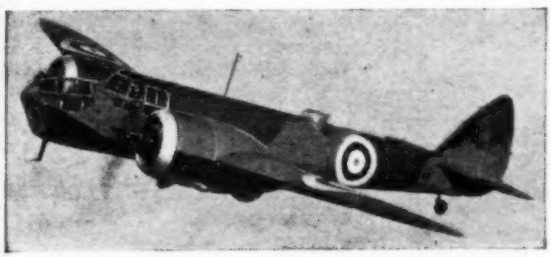
INTRODUCED in 1938, the Mitsubishi OB-97 was, until comparatively recently, the standard heavy bomber of the Japanese Army Air Service. This type, powered by two 870 h.p. Kinsei radials, has a top speed of only 220 m.p.h., and is now used mainly as a transport (with certain modifications). The latest version of the "97," the Mark III, which goes under the code name of Sally, substitutes a power-operated turret for the raised dorsal "glasshouse," has a 2ft. increase in span, and more powerful Kinsei engines, otherwise its general characteristics are much the same.

Chief features are mid-wings tapering uniformly to small round tips and dihedral from narrow flat centre-section; wide tailplane with backswept leading edge; tail fin and rudder; streamlined oval-section fuselage with glazed nose. Dimensions: Span 72ft. 2in., length 52ft. 8in., height 12ft., wing area 675 sq. ft.

Flying Attitudes



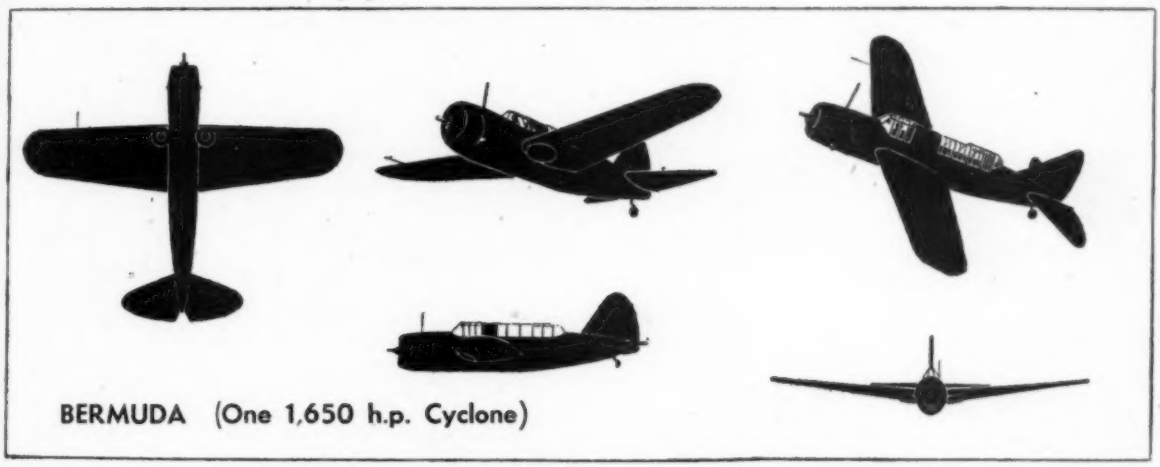
BLENHEIM IV (Two 840 h.p. Mercury XV)



Blenheim IV Multi-purpose.

A VARIETY of duties have been safely entrusted to the Bristol Blenheim IV, of which there are a number of versions. Primarily a medium day bomber and powered by two 840 h.p. Bristol Mercury XV radial engines, it has a top speed of 295 m.p.h.

Detail recognition points differ with the various versions, some having a small blister with a rearward-firing gun under the chin, others having four fixed forward-firing guns in a shallow trough beneath the fuselage, but the essential characteristics remain the same; tapered mid-wing with dihedral from flat centre-section and duo-curve tips, shallow streamlined fuselage with blunt, semi-glazed nose and two-gun dorsal turret, and the typically "Bristol" tail unit. Dimensions: Span 56ft. 4in., length 42ft. 9in., height 9ft. 10in., wing area, 469 sq. ft.



BERMUDA (One 1,650 h.p. Cyclone)

A NUMBER of modifications were made to the Brewster Bermuda dive-bomber for the R.A.F., notably the removal of the gun-turret at the rear of the cockpits in favour of a "free" gun position. In the States the type has the name of Buccaneer, having originally been ordered by the Navy, with whom it is officially designated the SB2A-2. In the U.S.A.A.F. it is the A-34. Power is supplied by a 1,650 h.p. Wright double-row Cyclone, and top speed is 310 m.p.h.

The mid-wings have slight taper from the roots to curved tips and dihedral from the roots; they are set well back, giving the effect of a long, blunt nose. Tailplane, originally elliptical, modified to "wing-nut" plan, and fin area of vertical tail surfaces increased. A long "glasshouse" covers the two cockpits. Dimensions: Span 47ft., length 39ft. 6in., height 15ft. 3in., wing area 370 sq. ft.

Brewster Bermuda (or Buccaneer) Dive-bomber.

Behind the Lines

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

Optimistic Hamburger

"THE new German programme for fighter aircraft production will shortly eliminate the enemy's air superiority on the Continent," says the *Hamburger Fremdenblatt*.

New C.G.S.

LIEUT. GEN. KREIPE has been appointed Chief of Staff of the *Luftwaffe* in succession to Col. Gen. Gorten, who was killed during the recent attempt on Hitler's life.

Continental Air

THE Slovak Company for Air Transport has resumed the operation of passenger services between Vienna and Bratislava and Bratislava—Tresov, with a stop at Sliac.

As in the past year the company employs twin-engined Focke-Wulf aircraft on these routes.

Air Smuggler

THE departure of the Berlin-bound aircraft from Bromma was somewhat delayed after it had been found that a German business man was attempting to smuggle a large quantity of dutiable goods out of Sweden.

The customs officers found that he was in possession of a large number of cigarettes, watches, jewellery, etc.

Ersatz Transport

BECAUSE of the fuel shortage and damage caused by air attacks, thirteen centres have been established in the German capital which accept freight for transport within Greater Berlin by tram.

To save electric power supply increased attention is being paid to battery-operated electric trains for conveying armament workers on an eight-mile line to and from their works. Each of such trains consists of five passenger cars accommodating 310 passengers and travels at a maximum speed of 28 m.p.h.

Auxiliaries

FOR nearly one and a half years the two senior classes of boys' intermediate and secondary schools have been serving as *Luftwaffe* or Navy auxiliaries within the framework of the Hitler Youth war effort campaign.

As from August 1st new regulations governing their service are coming into force: in place of the two classes which hitherto became auxiliaries, in future only one class will join, so that boys will stay a year longer at school. But this concession forced on the Nazis by the rapidly decreasing educational standards of young men drafted into technical military services is not without compensation: the total number of *Luftwaffe* auxiliaries will remain the same, it is announced, and a number of young workers "will be allowed to participate" in this service. Young workers born in 1928 who are not engaged on war priority work have been asked to volunteer.

Luftwaffe auxiliaries should serve anywhere within the Reich.

Air Torpedo Comments

FIRING the flying bombs is a difficult and dangerous job, according to a Belgian engineer, who has seen the launching of the air torpedos and gave this description:

"The ground crews must be protected by steel shields against the gases and explosions arising when the bombs are released. The officers directing operations sit in specially constructed portable concrete pill-boxes with narrow eye-slits.

"A special apparatus is used to follow the bombs' course. It consists of an illuminated graduated glass screen on which the robot throws an image as soon as it is released.

"The image moves to left or right as the bomb deviates from its course; when the bomb strikes the ground the image disappears."

* * *

The German controlled Belgian Home Service says that a V.1 projectile can be built twenty times as quickly as a normal fighter aircraft, and quote German reports as saying that many factories have been devoted now to their production.

* * *

Ignoring the effect of the destruction of oil refineries on the mobility of other German arms, Berlin propaganda asserts that Germany will always have sufficient petrol to continue the use of air torpedoes against London. In support of this argument it gives the following calculation: "It has been estimated in London that every flying bomb carries 560 litres (123 gall.) of fuel. Let us assume that this figure is accurate. How small is the consumption compared with that of the old style of Anglo-U.S. air operations? Let it further be assumed that the explosive load of the flying bomb equals that of a twin-engined bomber over the same distance.

In such case the orthodox machine would need 990lb. of fuel for one flight or 1,980lb. of fuel for the return journey. A further 330lb. would be required for the grouping and assembling of the bombers as well as for their tactical approach to the target. Thus 2,310lb. of fuel would be needed in such a case, which is just about treble the amount required for flying bombs. Moreover, it should be borne in mind that the latter need only the very poorest quality of petrol and no lubricating oil; their running cost is therefore less than half that incurred by Allied Air Forces for the same task."

Needless to say, this calculation, even if it were essentially correct, is completely misleading, as it is based on a comparison of two entirely different weapons. It ignores the relative resources of the two belligerents and does not mention the general effect of the fuel drain on Germany's war machine

Airborne

GERMAN airborne troops were recently employed in operations against French patriots in some regions of Southern France, says the German Transocean Radio.

Appointed

COL. MARIO MALTESE has been appointed Under-Secretary of State for Air in Mussolini's neo-fascist cabinet.

The Chief of Staff of the air force is Gen. Arrigo Testari.

Sentenced

CAPTAIN GHICA CANTACUZINO MATEI, of the Rumanian Air Force, has been sentenced by a court martial to military degradation, confiscation of property and death for enabling others to cross the frontier secretly.

Two lieutenants were also condemned to death for instigating desertion.

Satellites

HUNGARIAN airmen are serving inside the *Luftwaffe* and are attached to a German army corps.

Maj. Gen. Aladar Szirmay commands the Hungarian Air Force brigade, which consists of reconnaissance formations flying Junkers aircraft and fighter units. The latter have been re-equipped in May with Me 109s.

Do-or-Die

SPECIAL formations of German officers, pilots and crews, whose families or who themselves have been completely bombed out and who are therefore determined to go to the utmost limits, are now being employed by the *Luftwaffe* to combat the U.S. bomber formations which enter Germany during the daytime.

The German Transocean Radio Service adds that the slogan of these "assault formations," as they are officially called in the *Luftwaffe*, is "Do or Die."

Impervious Hanna

MORE information is now available about the part played by Hanna Reitsch in the development of the flying torpedo. (See *Flight*, August 3rd, Behind the Lines.)

The German Telegraph Agency, quoting from armament industry circles, says that one of the most critical phases in the development of the V.1 occurred in November, 1942; for reasons which could not be discovered in laboratory tests the experimental flying torpedoes showed a tendency to lose their wings after a flight of about 150 feet. It was therefore, decided to construct a special type fitted with a landing gear, and in which the explosives were removed, and a seat installed for the test pilot. From several pilots who volunteered for tests, Hanna Reitsch was selected because of her small size and her weight of 95lb.

"This woman," says the report, "is impervious to atmospheric pressure. In diving she often withstood speeds of more than 530 m.p.h."

Yugoslavia and Aviation

The Future of Her Civil Air Policy

THE particularly favourable geographical position of Yugoslavia and her great pre-war interest in civil aviation under the Royal Aero Club of Yugoslavia, *Nasa Khila* (Our Wings), and later of the *Aeroput* air lines stood the test remarkably well, and this important activity holds promise of a prosperous future.

Post-war plans for civil aviation in Yugoslavia should be based on the need for full international co-operation and territorial safeguards, as it must be emphasised that the so-called Axis Powers are Yugoslavia's big neighbours, with economical and political expansion policies heading south-eastwards. The safeguard necessary for post-war international air-transport, particularly for small nations, must not be vague; and the guarantees for the integrity of these small nations must be based upon the dictum of "indivisible peace," and tuned and co-ordinated with the complex technical and economical planning of the big nations to ensure safe future development of air transport.

IN our issue of August 3rd, 1944, we published an interview with Air Vice-Marshal Janousek, in which he put forward the Czech view of post-war civil aviation. The present article was written by a Yugoslav staff officer in London, and sent to us by General Radovitch, of the Yugoslav Embassy.

Still fresh in our memories are the fatal disruptive activities against Yugoslavia's consolidation and its integrity, displayed in Yugoslavia by the *Deutsche Lufthansa* and the numerous *Deutsche Reisebüreaux*, or travel agencies, and the so-called "tourists," and by the similar Italian *Enit* and *Cit*, all extremely active and dangerous centres of organised fifth columnists in the guise of agents, representatives of commercial firms, clerks, film-stars, etc. . . .

Freedom of the Air

The "Freedom of the Seas" concept stops at the water's edge, and some solution must be found to cope with the "Freedom of the Air,' thereby appealing to every nation involved and establishing, at the same time, a point of law for international usage. From Trieste to the Albanian frontier on the Adriatic Sea, Yugoslavia has a 650-km. (403 miles) long developed coast, running in a line N.W.-S.E., and forming a link in the straight loxodromic London-Cairo route within a total distance of 3,640 km. (viz., London-Trieste: 1,300 km. (806 miles), or 5 *hours'* flying at an economical cruising speed of about 250 km./h. (155 m.p.h.); and another 9.5 hours for the distance of 2,340 km. (1,450 miles) from Trieste to Cairo). An optional stop at Athens, half-way between Trieste and Cairo, would reduce the last flight (non-stop) to about 4 hours. In pre-war times British officials, tourists and business men used to travel to Trieste by rail, and from there by a liner of the Yugoslav Lloyd Line to Alexandria, or by Italian liner of the *Lloyd Triestino* . The Yugoslav Air Lines could participate in this Trieste-Cairo air service within the boundaries of its frontiers as an integral part of its tourist service along the Dalmatian Coast, with its remarkably beautiful scenery, its 600 islands, favourable climatic conditions and numerous safe natural harbours, ideal for seaplanes.

Yugoslav Sacrifices

By the secret Treaty of London, 1915, Trieste, with the Yugoslav Peninsula of Istria, were deprived of the only natural and important harbour which served the Yugoslav and Central European hinterland leading to the most efficient communication thoroughfares and standard gauge railways along the Sava and Danube valleys towards Zagreb, Belgrade and the Black Sea. The Yugoslav peoples hope that their present tremendous sacrifices will not be in vain in the common struggle for freedom with the United Nations, and that justice will prevail as well on ethnographical as on economical claims to which Yugoslavia is entitled.

Reverting to the above-mentioned international agreements and air policies, and referring to her share in international collaboration, Yugoslavia still awaits the decisions of the big nations, particularly along the following lines:—

(1) Will these laws be patterned after the law of the sea that governs the coastwise and foreign trade services?

(2) Will the long-range aircraft of the future disregard the island bases that some countries may have to offer in an exchange or barter; or

(3) Will bilateral contracts between airlines and individual countries be recognised?

(4) Is *one* great company to represent a determined nation in competition with foreign lines, or

(5) Will numerous national lines fly the oceans, the continents, specified sectors of important lifelines, etc., of interest to foreign countries, but in national territorial sectors, etc., etc.?

Some great nations argue in favour of a single great overall airline, while others brand this idea as a monopoly and plead for open competition. Competition is blessed by some and cursed by others, but those who bless it find its opposite in monopoly, and those who curse it find its opposite in co-operation. Yet surely all would agree that monopoly is bad and that co-operation is good.

These problems must be ironed out before any nation can embark on this business with a reasonable sense of security (national and commercial), and the outcome, at this particular time, is a matter for conjecture.

In addition to these general problems, Yugoslavia, as an agricultural country, looted and entirely devastated by the enemy, has to cope with the technical problems in connection with air service and policy. Its economic reconstruction, following a relief period of, say, 18 months, cannot be accomplished by *laissez-faire* methods which include violent changes in demands, without permanent grave maladjustments in the productive and financial structure of Yugoslavia, with subsequent harmful fluctuations in its economic activity. Yugoslavia therefore expects from the post-war economic charter privileged economical and financial support for the rise of its industries and supply of civil aircraft, fuel and accessories; and these, may we be allowed to say, without the pressure of vested interests and possibilities of rapid profits.

Future Guarantees

. The above-mentioned guarantees must be included in the future peace treaties, which must be basically framed on solid conceptions of *collective* security. It is only under these auspices that a sincere collaboration and "freedom of the air" concessions could be granted to foreign countries for the common welfare—and in promoting common prosperity—particularly for the Balkans, which represent the turntable of the link between the East and the West, and are situated on the flank of the Mediterranean sea lane lifeline. Provision must be made to enforce the decisions of future peace treaties on behalf of the present faithful Allies, Yugoslavia and Greece. The reconstruction scheme of Yugoslavia must also cover its industry and its general transportation system. An integral part of such a scheme should cover the revival of the air transport services, which must be tuned in accordance with future economic rulings for the development of

YUGOSLAVIA AND AVIATION

the aeronautical industry in Yugoslavia, and in which field of activity our great Allies could find commercial expansions in manifold different industries which are dependent on raw materials such as aluminium, copper, lead, quicksilver, etc., etc., and useful for the aeronautical industry, etc.

Taking into consideration the different unfavourable factors which, for a long post-war period, will be liable to handicap any rise of civil air transport services in Yugoslavia, we believe that the following suggestion for a civil transport policy and industry in Yugoslavia would be the solution most likely to be acceptable, and to satisfy the available financial and economical structures and conditions, all co-ordinated for the suitable running of the civil air services.

For the aeronautical industry the economic principles must be in harmony with the national economy as the basis for its future development in the service of civil aviation and air transport, and in a spirit of air-mindedness for the realisation of these services.

A Short Survey of Civil Aviation in Yugoslavia

On January 14th, 1930, a civil aviation section was formed at the Air Force Command. That meant that civil aviation was under the control of the military authorities.

Civil aviation had two pioneers in its development and progress: The Royal Aero Club of Yugoslavia, *Nasa Krila* (Our Wings) and *Aeroput* (Air Ways), the association for air travel. Both of these were aided by State grants.

Nasa Krila was founded in 1922. Its aims were to make flying popular in the country, as well as to train young men of 17 to 21 in preparation for service with the Air Force. It had 198 committees in all parts of the country, with 33,426 members and 23,871 junior members—in all, 57,297 members in 1939. The club was affiliated to the *Federation Aeronautique Internationale*.

The instructors of the club worked in three directions: training of pilots; training in gliding; and training in the making of model aircraft. There were six schools for the training of pilots, at Belgrade, Palanka near Smederevo, Jagodina, Ljubljana, Zagreb and Borovo. From 1932 to 1939, 346 members passed out as trained pilots. At the same time 7,059 qualified in gliding. There were 24 branches in towns for the construction of model aircraft, through which 9,800 members passed.

The club had 93 aircraft, mostly sports models or military training and communication aircraft which had become obsolete for military purposes.

Aeroput was founded and began its work in 1928, when the first aircraft of the association instituted the service between Belgrade and Zagreb. While in 1928 this association completed 148,840 kilometres of travel, in 1939 it completed 622,556 kilometres. The number of passengers and the weight of goods transported by aircraft of *Aeroput* in 1939 were:

Passengers	12,687
Mail	10,590 kg.
Luggage	77,123 ,,
Goods	181,021 ,,

2,815 flying hours had been completed by then.

The lines served by aircraft of this association in 1938 were:—Zagreb-Belgrade and return. Daily except Sundays from 2/5 to 22/10; Belgrade-Skoplje-Salonika and return. Once a week from 1/5 to 30/9; Belgrade-Sofia and return. Three times a week from 9/5 to 30/9; Belgrade-Sarajevo and return. Daily from 1/5 to 15/9; Sarajevo-Dubrovnik and return. Daily from 15/6 to 15/9; Ljubljana-Sushak-Zagreb, from 15/6 to 21/7; Ljubljana-Zagreb, from 25/7 to 31/8; Dubrovnik-Sarajevo-Zagreb-Vienna-Brno-Prague, daily from 15/6 to 31/8; Belgrade-Dubrovnik and return. Daily except Sundays, from 1/7 to 31/8; Bucarest-Belgrade-Zagreb-Venice-Milan. Daily from 1/9 to 30/9; Belgrade-Podgorica-Tirana and return. Three times weekly, from 23/8 to 22/9.

Aeroput had in 1938 the following types of commercial aircraft:—

Lockheed-Electra	7	(the main type)
Spartan	2	(at Sushak)
Caudron-Goeland	2	(at Skoplje)
De Havilland Dragon-Rapide ..	1	(at Skoplje)
Mitrovitch MMS-3	1	
Fox Moth	1	
Gipsy Moth	1	
Total	15	

Flying Personnel:—6 pilots, 5 co-pilots and 6 wireless-operators.

Airports:—Ljubljana, Zagreb, Sarajevo, Belgrade, Skoplje, Borovo, Sushak, Dubrovnik (Gruda), Podgorica, Nish and Split.

Seaplane Stations:—Belgrade, Divulje, Dubrovnik, Kumbor (Kotor), Split, Sushak and Vodice (at Shibenik).

P. P. V.

TWO GERMAN AIRCRAFT INNOVATIONS

THE past week has brought news of two new developments in German operational aircraft, namely, the rocket-assisted Me 163 fighter, and the Me 109/Ju 88 combination, said to be intended chiefly for use against shipping. Very little exact information has become available on either of these developments up to the time of going to press; enquiries from official sources in this country have not added to the limited amount of "gen" originally released.

There is, of course, nothing very new in the idea of augmenting the power of the normal engine for brief periods by means of rockets. The Germans were reported, long ago, to have employed this method of assisting the take-off of bombers with a substantial overload, but the Me 163 is the first example to be encountered of the principle being applied to an enemy fighter. From the reports of Lightning and Mustang pilots of the U.S.A.A.F., who first saw the new type last week whilst escorting heavy bombers, it seems clear that the rocket attachment was used to give an extra burst of speed over a brief interval in order to avoid combat. Capt. A. F. Jeffrey, a Lightning pilot, described how the Me 163 he was pursuing pulled up into a climb and "used his rocket power intermittently."

Unfortunately, the news story as released did not even disclose whether the Me 163 is a single- or twin-engined fighter; whether it is a modification of some familiar type or a completely new design. Enquiries were made in appropriate quarters, but the "official" reply was such that one can only assume it indicated a refusal, rather than an inability, to give any further data; how else, indeed, does the type number of this enemy aircraft come to be known?

The Me 109/Ju 88 composite aircraft is, from the report issued, a Ju 88 converted into a flying bomb with an Me 109 attached to control it during the take-off and to direct it towards its ultimate target. Capt. R. C. Lewis, an A.A. officer at a coastal gunsite in Normandy, who is stated to have submitted a report on this composite aircraft, told a Reuter correspondent that all the forward armament of the Ju 88 was removed and the forward section of the fuselage filled with explosive. The engine and flying controls of both components are operated by the pilot of the Me 109—the upper component—who can set the Ju 88 component on a predetermined course before separation.

"It is reasonable to assume (though, once again, there is as yet no official information available) that after separation the Ju 88, now virtually a flying bomb, remains under the radio control of the Me 109 pilot, who "flies" it into its target from (he hopes) a safe distance. Without remote control by radio this latest German air weapon would, of course, be nothing better than a sort of super-doodlebug incapable of being aimed at any target smaller than a large city.

Civil Aircraft Engines

Liquid- or Air-cooled? : The Claims of the Radial : Vital Importance of Long Overhaul Life

By C. H. POTTS, Sqn. Ldr., R.A.F. *(Ret.)*

THERE has been a great deal of talk recently concerning the type and size of long-range large aircraft which we can expect to see in use for civil air transport after this war, but little has been said about what is, in my opinion, the key to producing reliable and successful aircraft for this purpose, and that is the aircraft power plant. Before discussing this particular subject it is important to keep in mind the meaning of the following terms:—

Power Plant refers to all the equipment for producing, controlling and maintaining power for flight of the aircraft, such as the complete power unit; fuel and oil systems; cooling; exhaust and silencing systems, etc.

Engine Installation. This term was used some years ago and refers to the same items as those given under Power Plant; in fact, it is just another name for power plant installation.

Power Unit is an expression not generally used, but it refers to the following items: engine; all auxiliary engine-driven equipment, such as fuel and oil pumps, starting motor, engine mounting, cowling, exhaust manifolds, oil and water-cooling systems, etc.

Overhaul Life. This term denotes the running-time of an engine in the aircraft before it is removed for complete overhaul.

Power Plant Installations

The power unit can be regarded as the joint responsibility of the engine and aircraft design branches; and the link between these two branches is power plant installation. The power unit is the responsibility of the engine-design branch. The remaining portion to complete the power plant is the responsibility of the aircraft design branch.

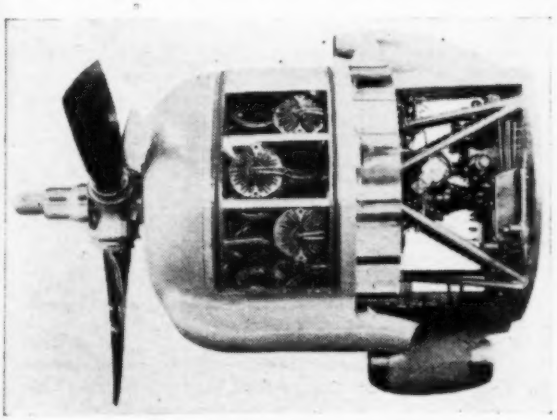
To obtain a clear picture of aircraft engine development and progress it is necessary to review the position from about 1920 to 1939. In the early days of this period the aircraft engineer, or perhaps to be more precise the automobile engineer and aircraft designer, knew little of one another's work or requirements, but gradually they became more closely associated, largely due to the Directorate of Technical Development, Air Ministry; but over the whole of this period there was never a very close collaboration. Towards the latter end the engine design branch had gained control and responsibility for the complete power unit construction, whereas in the early days they only had the bare engine to make and supply. The link between the two design branches mentioned above was introduced and controlled by D.T.D., Air Ministry, by a department commonly referred to as Engine Installation Dept., but it covered the whole field of power-plant installation in a technical capacity.

THE views expressed by the author of this article will not be shared by all. His subject is in itself fundamentally of a controversial nature, and some of the statements will probably be challenged.

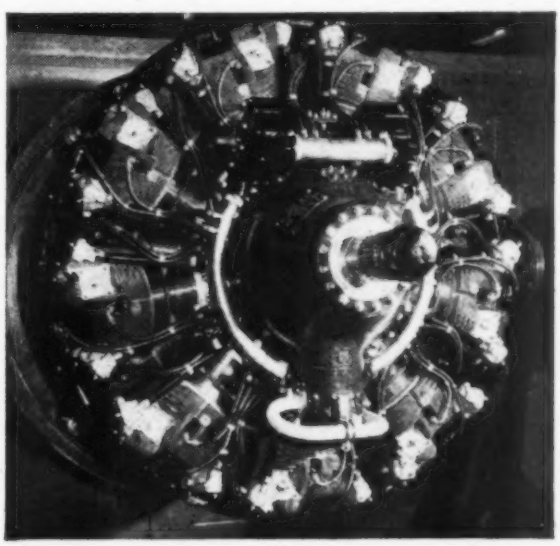
Although expressing the opinion that both liquid-cooled and air-cooled engines will be used for many years to come, Sqn. Ldr. Potts shows a strong preference for the radial air-cooled. The introduction of "buried" engines may, however, change the picture so far as very large aircraft are concerned.

At the end of the last war there was no civil aviation to fall back on, such as we shall have after this war, but it was not long before several types of military aircraft were converted and many types of engine adapted. Gradually all types of aircraft engines were discarded with the exception of the air-cooled radial poppet-valve engine. I am referring only to the engines required for the large civil types of aircraft specially built for work on the air lines.

During this period the U.S.A. developed the air-cooled radial poppet-valve engine much on the same lines as we did in this country and, for civil aircraft, to the exclusion of all other types of engine. This general trend of develop-



Power egg with 14-cylinder Bristol Hercules sleeve-valve radial. No photograph of the Bristol Centaurus is allowed to be published.



The Wright Cyclone 18 is credited with 2,200 h.p. from a piston displacement of 3,350 cubic ins. Diameter is 55 ins.

CIVIL AIRCRAFT ENGINES

ment, common to both countries, is very significant as will be seen later.

The following list of engines is representative of the types in production in both countries in 1939:—

Rolls-Royce.—Merlin V-type liquid-cooled.

Napier.—Dagger H-type air-cooled.

Bristol.—Pegasus, radial air-cooled (9 cyl.).

Wright.—Cyclone, radial air-cooled (9-cyl.).

Wright.—Double Cyclone radial two-row air-cooled (14 cyl.).

There was never any economy in building liquid-cooled engines in small powers, and in the larger sizes compactness makes accessibility difficult. It was largely for this reason that they were not in favour for civil transport aircraft, but, of course, there are other reasons, such as extra power-unit weight and the service difficulties of the "plumbing." However, the power unit forms a large proportion of the drag of an aircraft, and therefore the aircraft designer will always welcome engines suitable for submerging into the wing, irrespective of whether it is liquid- or air-cooled.

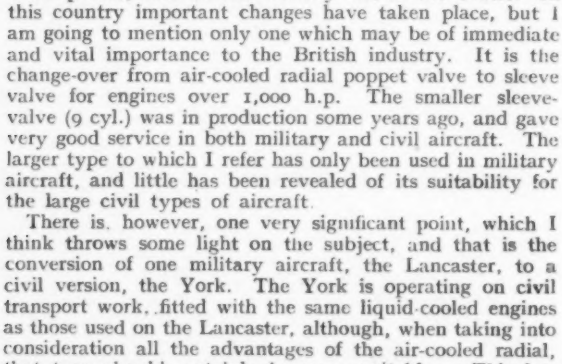
Time alone will decide whether or not the liquid-cooled engine will be chosen for use in the civil air liners or other large aircraft in which the power unit is cramped and inaccessible, and more especially when comparing the position with the air-cooled radial which has gained such a high reputation in U.S.A., operating so successfully in civil aircraft throughout the world for many years past.

There have always been the two schools of thought on the problems and application of liquid versus air-cooled engines, but I venture to predict that both will continue to find a place in aviation for many years to come.

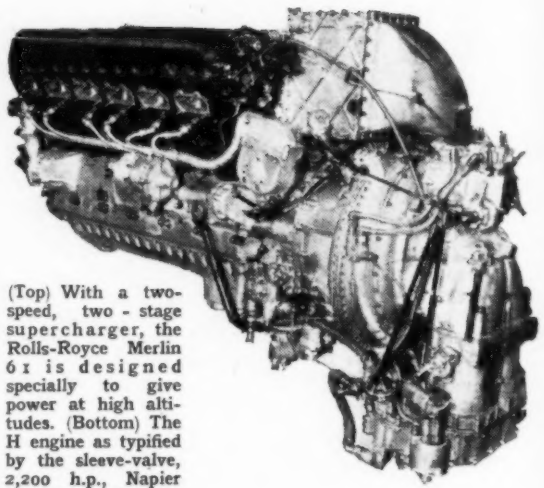
Trend of Development

It is necessary, and interesting for the purpose of this discussion, to review and note the changes that have taken place since 1939 in the general trend of aircraft engine development, both in this country and in the U.S.A. In this country important changes have taken place, but I am going to mention only one which may be of immediate and vital importance to the British industry. It is the change-over from air-cooled radial poppet valve to sleeve valve for engines over 1,000 h.p. The smaller sleeve-valve (9 cyl.) was in production some years ago, and gave very good service in both military and civil aircraft. The larger type to which I refer has only been used in military aircraft, and little has been revealed of its suitability for the large civil types of aircraft.

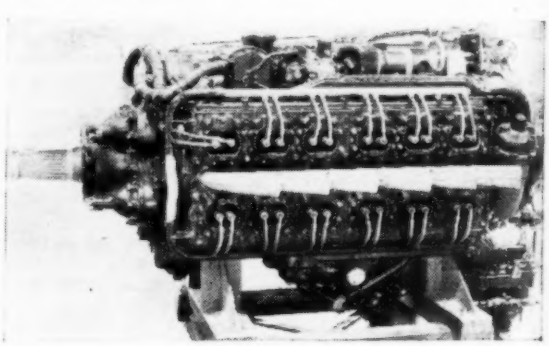
There is, however, one very significant point, which I think throws some light on the subject, and that is the conversion of one military aircraft, the Lancaster, to a civil version, the York. The York is operating on civil transport work, fitted with the same liquid-cooled engines as those used on the Lancaster, although, when taking into consideration all the advantages of the air-cooled radial, that type should certainly be more suitable. This has



The B.M.W. 801 14-cylinder two-row engine is Germany's contribution to modern radial power plants.



(Top) With a two-speed, two-stage supercharger, the Rolls-Royce Merlin 61 is designed specially to give power at high altitudes. (Bottom) The H engine as typified by the sleeve-valve, 2,200 h.p., Napier Sabre has points for "buried" installation.



ample support from the experience gained before the war. United States aircraft engine development has shown little or no change in this direction, and they have stuck to the pre-war practice of developing and using only the air-cooled radial poppet-valve engine. This policy shows signs of continuing after the war for all large civil air transport types, some of which are already being tested.

As in the early days so to-day, all aircraft engines, before being accepted to go into production, have to pass a type-test; but until recently there were no test requirements for the power unit, or, in fact, any special flight tests. To-day new and complete power units have to pass special flight tests, which are laid down by the Air Ministry. This is extremely important and obviously a step in the right direction, but there is still more testing needed in order to obtain the full information required for the large types of civil aircraft operating over long distances. For instance, the fact that an engine has passed the standard type test, and possibly the power-unit tests, does not guarantee that it will function in the same manner in an aircraft. Therefore there must be some further flight tests to ensure reasonable reliability of the power unit and at the same time of the whole power plant.

Overhaul Life

There is evidence of such tests now being laid down in the recent reports of the long-distance flights of the York. It is reasonable to assume that the results of such flight tests, if carried out under certain conditions and complying with special requirements, will be invaluable to any airline company when purchasing an aircraft, as it enables them to assess the true value of the power plant and, in particular, the power unit. Such tests will reveal the "overhaul life" of the power unit, which is the point I wish to emphasise.

This term has been used in the past only in connection

with the engine, i.e., overhaul life of engine. In future it will be essential to obtain the overhaul life of the whole power unit, and this will make all the difference. For instance, suppose that the overhaul life of the engine has been laid as 500 hours, but that the power-unit flight tests reveal a defect; that failure occurs on an item outside the engine main assembly at approximately 150 hours, and that this particular component can be repaired or replaced without removing the engine.

If such a failure will affect the functioning of the power unit sufficiently to cause the aircraft to force land, then it must be treated as equal to an engine failure, in which case the engine overhaul life is no more than 150 hours. This clearly indicates that the all-important factor for reliability is the overhaul life of the power unit and not of the engine in itself.

I am quite certain that in future, before an airline company decides to purchase an aircraft complete with engine, they will want to know the overhaul life of the power unit and how it was obtained. If any useful purpose is to be served, the flight tests in question will have to be carried out over the actual route on which the aircraft will eventually operate, and, what is more important, the tests must be carried out by the airline pilots, and the engine-running care and maintenance carried out by and under the supervision of their engineers and mechanics. In other words, no outside assistance or advice other than that which could be normally obtained can be permitted.

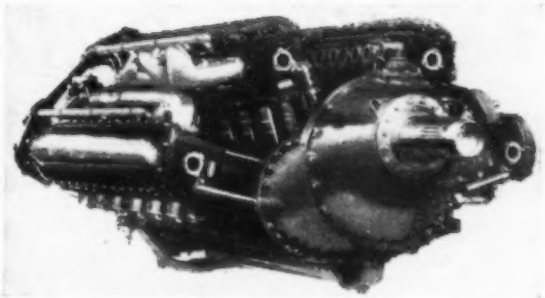
Problems of Peace

We are now rapidly approaching the return of civil aviation. Therefore it is of the utmost importance to take stock of the position in this country. British civil aviation has a stiff uphill job in front of it, and, apart from having the right type of reliable aircraft, it must also have the right type of power unit, with a reliability equal to that of competitors. In order to ensure this, everything will depend on the overhaul life figure of the power unit and not just of the engine itself.

Many people are asking if it is possible to convert for civil air transport the aircraft engines now being used in military aircraft. Without going into all the details, the answer is yes. This has already been confirmed in the case of the York, and the same applies to other types of engines. However, it is difficult to see where suitable engines of sufficient power can be obtained from any of the present military types for the large types of aircraft, even of the present size and all-up weight of the York.

I am now suggesting that in spite of the fact that the York is already flying with a military engine of the liquid-cooled V type, it is not the most suitable type or power of engine for this size of civil long-range aircraft. As I have already mentioned, the air-cooled radial engine, which is obviously more suitable and in greater favour, has not yet been considered for this civil version. Further, when considering the still larger types of 100 tons recently mentioned, the power units for this size are certainly not in sight. So far as the British air-cooled radial engine is concerned, there is no alternative, it is either the air-cooled sleeve-valve type or nothing; all the eggs are in one basket, and this may yet prove to be a great drawback in the future. The U.S.A., on the other hand, are in a very different and better position, having, as I have previously mentioned, adhered to her pre-war policy of sticking to one type, which over many years of development has proved itself to be very reliable and the most favoured type of engine for civil aircraft. There is still no reason to doubt that the U.S.A. are keeping pace with the latest requirements for increase of power for immediate post-war civil requirements.

If, as has recently been published, this type of engine has reached the 3,000 h.p. mark for a single unit, then the Americans certainly lead the world. On the other hand, if the reason for not choosing the air-cooled radial for the British civil post-war version of aircraft is due to something being not entirely satisfactory, then it is reasonable to assume that there is only one road open, and that is to use the U.S.A. engines for our immediate post-war civil requirements. That is, of course, only so far as the large long-range aircraft type is concerned.



Virtually a double-crankshaft version of the Allison 1710 vee engine, the Allison 3420 is a four-bank 24-cylinder liquid-cooled engine.

To sum up, my forecast of the aircraft engine post-war position is as follows: Military types can and will be modified and converted. Liquid-cooled V-type engines will be used immediately after the war as a stop-gap, but will be discarded later in favour of other types, especially for outputs above 1,200 h.p. U.S.A. will lead the world with the air-cooled radial poppet-valve type. The overhaul life of the power unit for any civil type will not be less than 750 hours. The most useful size of aircraft will be similar to the York, having approximately a total weight of 60,000 lb.

The progress of the larger types will depend entirely on the development and introduction of the power unit of between 1,500 h.p. and 3,000 h.p., with an overhaul life of not less than 750 hours. The maximum number of power units for an aircraft will be six. The 100-tons total weight aircraft fitted with reciprocating air-cooled radial engines of British type is a long way off.

It is to be very much regretted that the Armstrong-Siddeley air-cooled radial poppet-valve type of engine was allowed to die out. Here was an engine which showed great promise, as has been amply confirmed in the Cheetah, a smaller engine of approximately 250 h.p. This was the most reliable engine ever produced of its type in this country, having an overhaul life in the Anson aircraft of 1,200 hours. I am of the opinion that the U.S.A. have a more suitable and reliable engine than this country in the air-cooled radial poppet-valve class. When I recently referred to U.S.A. leading the world, I was referring to this particular type of engine. Before the war it had a higher overhaul life figure as compared with British engines of similar type and output.

Government Control

It is difficult to find the reasons for this, especially when taking into consideration one important fact, that the workmanship and finish of British engines is second to none in the world, and certainly much superior to that of U.S.A. There is also more handwork in the British engines, but this may be a drawback. I should say it is largely due to the difference in general policy. For instance, this country for many years past has given financial support to all the main aircraft engine firms for design and development; this has allowed a certain amount of Government control, which usually destroys initiative and promotes so-called spoon-feeding. The U.S.A. have designed aircraft engines and developed them without Government control and with complete success. This does not in itself account for what we are looking for, but it does introduce a factor which to many passes unnoticed: when a major defect arises in design, a firm under Government control must take the line of least resistance and cost, with the result that where it would be better to scrap the whole design of the particular part or component, a modification may be introduced, sometimes with success but sometimes not, and then a further modification is made. This, I suggest, is the real trouble.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

FUTURE OF THE HELICOPTER
More Attention Needed in Britain

PERUSING American technical periodicals, one is struck by the wide interest in the helicopter. Indeed, the helicopter has come of age—and if a considerable field for development is still left, it is already quite clear that it will play an important part in post-war civil flying.

This interest in the U.S. is manifested by the fact that about forty different firms are engaged in the development or design of different helicopters.

Is it not time that more attention be paid in this country to the further development of this type of aircraft, a lot of its initial success being due to British effort.

The small inter-urban operator, the airport to town service, and last, but not least, the private flier in this country and throughout the Empire, will need helicopters. Who is going to supply them?

"SPOT LANDING."

"OUT OF EVIL—"
Why Not Jet-driven Crewless Mail-planes ?

WHILST it is typical of the Germans that they exhibit most of their ingenuity in evolving new methods of destruction, may not post-war good spring from the present evil of the air torpedo?

Perhaps my suggestion has already been forestalled, but it has occurred to me that the jet-propelled pilotless aircraft could be developed for the express delivery of mail. Radio control could be employed to guide the "jet-mail" to its precise destination and to bring it down in one piece, and it would, of course, need to be far less thirsty on fuel than the disgusting doodle-bug.

One can imagine that the general public may well be somewhat lacking in enthusiasm for jet-propulsion in any form after their unfortunate introduction to its practical application, but I understand that the Whittle type of unit makes quite a different sort of noise, and thus the handicap of an unpleasant "association of ideas" might not be inflicted on the jet-mail.

The main point seems to be, how far away is it—technically—from being a reasonably *economic* proposition?

"REALIST."

POST-WAR A.T.C.
Chance for a Commonwealth Youth Service

AS we are gradually approaching the closing stage of the war I believe that some post-war plan for the A.T.C. should be adopted. This organisation has done wonderful work in building up keen personnel for the R.A.F. during this war. But what of the future?

It has been stated that the A.T.C. will continue after the war and that the training will be of value in civil aviation. So far so good. But should not more definite plans be formulated on the lines of our plans for other branches of the national effort?

Some such plan would do much to offset the inevitable disappointment felt by many cadets at the recent announcement that during the war they are likely to be switched over to the Army.

Incidentally, would it not be beneficial to establish the A.T.C. as a truly Empire youth service in which young men of all the Dominions, Colonies, etc., could take active part? Such an organisation should provide for A.T.C. units even in the remotest corners of the Empire. Flying is a "language" all young men understand and can therefore provide a bond of fellowship among the rising generation of this Commonwealth.

"FLYING CITIZEN."

ANONYMOUS SQUADRONS
Why this Silence About R.A.F. Units ?

THROUGH the medium of your columns I should like to appeal to the Air Ministry to be more free than hitherto in mentioning the identity of the squadrons of the R.A.F. which distinguish themselves in the present operations.

Of course, I do not suggest that anything should be published which would be of use to the enemy; but surely the time is past when the publication of the identity of the squadrons engaged could do anything to set the *Luftwaffe* on its wings again. Regiments engaged are now mentioned periodically, though the campaigns in which they are fighting are not over. I admit that to state that the Black Watch or the Devon Regiment is engaged in Italy or Burma gives the minimum of information, because every regiment has a number of battalions, some regular, some Territorial, and some raised for duration only. All the same, I fail to see how the announcement that Squadron No. 5,000, or whatever it may be, has done something over Normandy or near Iceland could help the *Luftwaffe*.

Some squadrons are mentioned occasionally in Air Ministry bulletins, mostly those squadrons which before the war belonged to the Auxiliary Air Force, but which are now absorbed into the general R.A.F. pool. The County of Warwick Squadron, for instance, does not now necessarily consist entirely or mainly of Birmingham men. One also reads at times of the doing of the City of Edmonton Squadron, which belongs to the Royal Canadian Air Force. But a veil is drawn over the doings of the ordinary squadrons of the R.A.F.

The mention of particular squadrons in connection with an especially good piece of work would have a stimulating effect on all ranks, and would be a source of pride to the friends and relations of the men who belong to that squadron.

"TENDERFOOT."

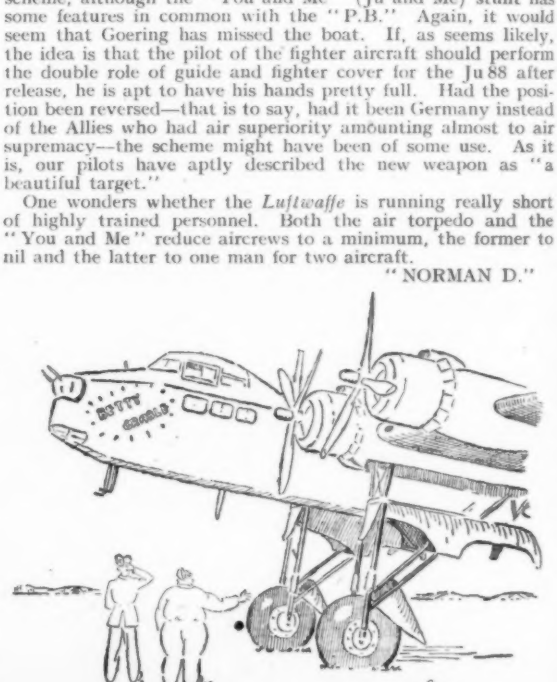
"YOU AND ME"
Is Luftwaffe Short of Personnel ?

GERMANY must be at her wits' end to know what to do. That is the only possible interpretation of her use of such contraptions as the air torpedo and her recent tentative essays with composite aircraft. Neither can possibly have any appreciable influence on the course of the war. It is, of course, true that the air torpedo has caused casualties in London and Southern England, and the material damage is certainly not negligible, as the Prime Minister's figures revealed. But by this time, when our production of all sorts of war material is so enormous, the man-hours lost by reason of the air torpedoes cannot affect our quantitative superiority. The Germans must be perfectly well aware of this, and had they been able to start these attacks at the time when we stood alone, and when we were hard pressed in building up our war production, the result might well have been far from negligible.

Just as difficult to understand is the enemy's use of the composite aircraft. The Short-Mayo Composite had a very different purpose, and so had the Pemberton-Billing "slip-wing" scheme, although the "You and Me" (Ju and Me) stunt has some features in common with the "P.B." Again, it would seem that Goering has missed the boat. If, as seems likely, the idea is that the pilot of the fighter aircraft should perform the double role of guide and fighter cover for the Ju 88 after release, he is apt to have his hands pretty full. Had the position been reversed—that is to say, had it been Germany instead of the Allies who had air superiority amounting almost to air supremacy—the scheme might have been of some use. As it is, our pilots have aptly described the new weapon as "a beautiful target."

One wonders whether the *Luftwaffe* is running really short of highly trained personnel. Both the air torpedo and the "You and Me" reduce aircrews to a minimum, the former to nil and the latter to one man for two aircraft.

"NORMAN D."



"It must be something to do with the remarkable undercarriage."

SORTIE'S END : With flaps down at 90 degrees, a Spitfire IX comes in to land at its base.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

High Command, A.E.A.F.

Air Vice-Marshal V. E. GROOM, O.B.E., D.F.C., to be Senior Air Staff Officer, Second Tactical Air Force.

Air Vice-Marshal Groom served previously during 1942 and 1943 on the special planning staff of the Assistant Chief of Air Staff (Policy), and on Air Staff planning duties at Headquarters, Fighter Command.

Air Vice-Marshal T. W. ELMHIRST, C.B.E., A.F.C., to be Air Officer Administration, Second Tactical Air Force.

This officer was appointed Air Officer in Charge of Administration Tactical Air Force, N.W. Africa, on March 1st, 1943. He had previously held a similar appointment at Air Headquarters, Libya, and was Air Officer Commanding, H.Q. Egypt. In June, 1940, he was a member of the Military Mission to Turkey.

Air Vice-Marshal L. N. HOLLINGHURST, C.B., O.B.E., D.F.C., to command an R.A.F. Airborne Force.

Air Vice-Marshal Hollinghurst, who was appointed A.O.C. of an A.D.G.B. group in July, 1943, had been Director-General of Organisation at the Air Ministry since June, 1941, having previously been Director.

Air Comdre. A. L. FIDDAMENT, D.F.C., to command an R.A.F. Transport Force.

Air Comdre. Fiddament was appointed Acting Commandant of the R.A.F. Staff College in January, 1943, having been Director of Personal Services at Air Ministry since April, 1942. Before then he was on the British Air Staff at Washington as Senior Air Staff Officer.

Appointments

Act. Air Vice-Marshal C. A. STEVENS, C.B.E., M.C., to be Officer in Charge of Administration, Third Tactical Air Force (Air Command, South-East Asia).

Act. Air Vice-Marshal W. M. YOOL, C.B.E., to be Air Officer in Charge of Administration, Technical Training Command.

Air Comdre. L. F. PENDRED, M.B.E., D.F.C., to be Assistant Commandant, R.A.F. Staff College.

Act. Air Comdre. W. H. MERTON, O.B.E., to be Director of Organisation, Air Ministry.

Act. Air Comdre. R. L. R. ATCHERLEY, O.B.E., A.F.C., to command a station and to be Commandant, Fighter Leaders' School.

Act. Air Comdre. H. E. NOWELL, O.B.E., to be Senior Air Staff Officer, R.A.F. Delegation, U.S.A.

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry and devotion to duty in the execution of air operations :—

Distinguished Service Order

Act. Wing Cdr. A. K. GATWARD, D.F.C., R.A.F.V.R., No. 404 (R.C.A.F.) Sqn.—Wing Cdr. Gatward has taken part in a large number of operational sorties. Recently he has been engaged on anti-shipping operations off the Norwegian coast. His brilliant leadership has inspired confidence in his crew and materially contributed to the successful conclusion of many engagements resulting in serious losses to the enemy. Both in the air and on the ground, this officer has set a magnificent example.

Sqn. Ldr. J. H. SAFFERY, R.A.F.V.R., No. 541 Sqn.—An outstanding officer, Sqn. Ldr. Saffery, by his untiring energy, enthusiasm and devotion to duty, has set a splendid example to his subordinates. He has taken part in a number of operational sorties to difficult and distant enemy targets. On one recent sortie he remained for over an hour over one of the most heavily defended areas in Germany, despite the most intense enemy opposition. This officer's sorties have been models to all for thoroughness of preparation and skill and resoluteness of execution.

Act. Flt. Lt. W. F. W. PORTEOUS, D.F.M., No. 7 Sqn.—This officer has completed a very large number of sorties, many of them demanding a high degree of skill and resolution. On three occasions recently, Flt. Lt. Porteous has participated in attacks on railway junctions, and the success achieved is a fine tribute to the accuracy of his bombing. He is a devoted member of aircraft crew, and his achievements have won the greatest praise.

P/O. R. R. REED, R.A.F.V.R., No. 576 Sqn.—One night in May, 1944, this officer piloted an aircraft to attack a target in Southern France. When nearing the objective the aircraft was attacked by a fighter. The intercommunication system was put out of action, but, although unable to receive any evading directions, P/O. Reed manœuvred with much skill. His aircraft, which had caught fire to the rear of the fuselage, had sustained extensive damage and went into a steep dive. With the greatest difficulty P/O. Reed succeeded in regaining control. The fire had subsided, but the mid-upper and rear turrets were out of action, leaving the aircraft defenceless. Nevertheless, P/O. Reed was determined to bomb the allotted target and went on to make a successful attack. Shortly afterwards another fighter attacked and further damage was sustained. Once more the aircraft was set on fire by the enemy's bullets, but the flames were extinguished by the flight engineer. The situation was by now most critical. The elevator and rudder trimmers were useless, the control surfaces had sustained damage, the hydraulic system was unserviceable, whilst the rear turret had been almost severed and was hanging loosely below the fuselage. To keep the aircraft level it was necessary for two members of the crew to help with the control column and the rudder control. Despite this, P/O. Reed

Flt. Lt. K. H. Tan, D.F.C., a Chinese pilot who flies with an R.A.F. "Recce" Squadron.

kept to his homeward course and finally reached base, where he landed the crippled aircraft on one wheel. He displayed superb skill, unbeatable courage and determination, and his leadership in the face of hazardous circumstances proved most inspiring.

Bar to Distinguished Flying Cross

Act. Sqn. Ldr. R. AYTOUN, D.F.C., R.A.F.V.R., No. 619 Sqn.—Since being awarded the D.F.C., this officer has taken part in further operational sorties against major enemy targets in Germany. As flight commander, his determination, courage and devotion to duty have been largely responsible for the high morale maintained by his flight.

Act. Wing Cdr. W. G. LOCKHART, D.S.O., D.F.C., R.A.F.V.R., No. 692 Sqn.—In February, 1944, this officer was posted to form and command No. 692 Sqn. Since then he has shown outstanding ability, and his leadership has been largely responsible for the fine record set up by the squadron. Wing Cdr. Lockhart has also continued to operate against the enemy with unremitting keenness and zeal, and has taken part in many operational sorties with success.

Act. Sqn. Ldr. C. P. C. DE WESSELOW, D.F.C., R.A.F.V.R., No. 97 Sqn.—Throughout his operational career Sqn. Ldr. de Wesselow has set an outstanding example, both as pilot and captain of aircraft. Each of his sorties has been a model of thoroughness, skill and determination. Since the award of the D.F.C., his coolness in the face of heavy odds and his courage in times of stress have been further displayed in a number of operational sorties.

Act. Sqn. Ldr. I. R. M. RYALL, D.F.C., R.A.F.O., No. 218 Sqn.—A most capable and skilful pilot this officer has completed two tours of operational duty. He has constantly displayed courage and determination, whilst his leadership and fine example have contributed very largely to the high standard of morale maintained in his squadron.

Act. Sqn. Ldr. J. A. WHITTET, D.F.C., R.A.F.V.R., No. 103 Sqn.—As flight commander he has exhibited the highest qualities of leadership and set a fine example by the indomitable spirit he has shown in the execution of his operational flying duties. Among the many important and strongly defended targets he has been detailed to attack during his second operational tour have been Berlin, Brunswick, Leipzig and Stuttgart.

Act. Flt. Lt. C. F. BEDELL, D.F.C., R.A.F.V.R., No. 139 Sqn.—This officer has completed a large number of sorties. He took part in the Battle of Britain and in numerous attacks on vital targets in Germany. The success of these attacks has been due in no small way to the courage, calmness and devotion to duty displayed by this officer and the methodical preparation he has invariably made, both in the air and on the ground.

F/O. R. MCCURDY, D.F.C., R.A.F., No. 44 Sqn.—F/O. McCurdy has filled the post of squadron gunnery leader since July, 1943, and has succeeded, during this period, in greatly improving the standard of efficiency among the air gunners of his squadron. Since the award of the D.F.C., he has taken part in a number of operational sorties which have included four attacks on Berlin. Throughout a long and arduous career F/O. McCurdy has shown great determination, cool courage and efficiency of a high order.

Act. Sqn. Ldr. J. W. PELLETIER, D.F.C., R.A.A.F., No. 97 Sqn.—Since the completion of his first tour of operational duty this officer has completed numerous operational sorties of an exacting and responsible nature. He has always shown the utmost keenness in pressing home his attacks and has proved himself a first-class operational pilot. His enthusiasm and ability as a captain of aircraft have been an inspiration to his crew and his squadron.

Act. Sqn. Ldr. I. F. TAMAGNO, D.F.C., R.A.A.F., No. 105 Sqn.—This officer has completed two tours of operational duty. Throughout his operational career he has maintained a high standard of skill and reliability, coupled with great courage and devotion to duty.

Act. Flt. Lt. T. V. MCCARTHY, D.F.C., R.A.A.F., No. 156 Sqn.—Flt. Lt. McCarthy has displayed great coolness and determination as a bomb aimer. He has operated in this capacity over most of the heavily defended objectives in enemy territory. Under very trying circumstances and in the face of heavy opposition he has invariably displayed courage of a high order and unfailing accuracy.

F/O. R. W. LAWTON, D.F.C., R.A.A.F., No. 460 (R.A.A.F.) Sqn.—F/O. Lawton, now on his second tour of operational duty, has taken part in attacks against such strongly defended objectives as Berlin, Leipzig, Augsburg, Stettin and Frankfurt. As an air bomber he has pressed home the attacks with a complete disregard of enemy opposition. This officer's coolness, co-operation and devotion to duty have contributed much to the successes attained by his crew.

Act. Sqn. Ldr. L. F. AUSTIN, D.F.C., R.C.A.F., No. 105 Sqn.—Since the award of the D.F.C., Sqn. Ldr. Austin has completed a second tour of operations. He has flown as captain of aircraft on a large number of difficult and dangerous sorties. Of many of the enemy's most heavily defended targets this officer has displayed unfailing reliability and skill.

Act. Sqn. Ldr. R. V. POWELL, D.F.C., R.A.F., No. 202 Sqn.—Throughout two tours of operational duty this officer has set an exceptionally high standard of ability, courage and leadership. In July, 1943, he was captain of an aircraft on patrol when a fully surfaced U-boat was sighted. An immediate attack was made and the enemy submarine straddled with depth charges. This was Sqn. Ldr. Powell's seventh attack on U-boats.

Distinguished Flying Cross

Flt. Lt. L. G. A. HADLAND, R.A.F.V.R., No. 9 Sqn.
Act. Flt. Lt. G. S. MORGAN, R.A.F.V.R., No. 576 Sqn.
F/O. W. BENTLEY, R.A.F.V.R., No. 626 Sqn.
F/O. R. G. C. PAGETT, R.A.F.V.R., No. 50 Sqn.
F/O. J. G. POYNTER, R.A.F.V.R., No. 10 Sqn.
P/O. R. A. C. COLLINGWOOD, R.A.F., No. 50 Sqn.
P/O. E. A. DOWLAND, R.A.F., No. 57 Sqn.
P/O. H. T. MOORIDGE, R.A.F.V.R., No. 10 Sqn.
P/O. A. W. PEAGNELL, R.A.F.V.R., No. 166 Sqn.
P/O. L. G. ROLTON, R.A.F.V.R., No. 61 Sqn.
P/O. J. W. D. RYAN, R.A.F.V.R., No. 10 Sqn.
P/O. J. E. WHATLEY, R.A.F.V.R., No. 10 Sqn.
P/O. J. B. WHITTON, R.A.F.V.R., No. 10 Sqn.
P/O. E. A. WILLIAMS, R.A.F.V.R., No. 61 Sqn.
P/O. E. G. WINTER, R.A.F.V.R., No. 97 Sqn.
W/O. C. C. ROLLINS, R.A.F.V.R., No. 576 Sqn.
Act. Flt. Lt. J. H. NICHOLLS, R.A.A.F., No. 97 Sqn.
F/O. T. J. O'DEA, R.A.A.F., No. 626 Sqn.
P/O. A. L. FULLER, R.A.A.F., No. 10 Sqn.
W/O. J. E. ATHERTON, R.A.A.F., No. 626 Sqn.
F/O. J. CRAIG, R.C.A.F., No. 97 Sqn.
P/O. W. H. LEDGER, R.C.A.F., No. 77 Sqn.
P/O. F. C. SIM, R.C.A.F., No. 166 Sqn.

SERVICE AVIATION

W/O. R. L. TAGGART, R.C.A.F., No. 166 Sqn.
Act. Sqn. Ldr. H. F. BREAKSPEAR, R.A.F.V.R., No. 100 Sqn.
Flt. Lt. L. F. BERRY, R.A.F.V.R., No. 622 Sqn.
Flt. Lt. R. F. DAVIES, R.A.F.V.R., No. 627 Sqn.
Flt. Lt. E. S. ELLIS, C.G.M., R.A.F.V.R., No. 625 Sqn.
Flt. Lt. J. STOKOE, R.A.F.V.R.
Act. Flt. Lt. M. J. BEETHAM, R.A.F.V.R., No. 50 Sqn.
Act. Flt. Lt. G. W. LUCAS, R.A.F.V.R., No. 10 Sqn.
Act. Flt. Lt. J. W. WARD, R.A.F.V.R., No. 102 Sqn.
F/O. D. R. BAXTER, R.A.F.V.R., No. 10 Sqn.
F/O. F. G. CHELL, R.A.F.V.R., No. 77 Sqn.
F/O. R. C. A. COWLES, R.A.F.V.R., No. 10 Sqn.
F/O. P. S. FOXCROFT, R.A.F.V.R., No. 627 Sqn.
F/O. D. J. LUNDY, R.A.F.V.R., No. 50 Sqn.
F/O. W. D. REES, R.A.F.V.R., No. 77 Sqn.
F/O. D. G. W. TAYLER, R.A.F.V.R., No. 139 Sqn.
F/O. K. L. WRIGHT, R.A.F.V.R., No. 207 Sqn.
P/O. D. R. DEARMAN, R.A.F.V.R., No. 207 Sqn.
P/O. A. E. GILES, R.A.F.V.R., No. 9 Sqn.
P/O. J. S. HENDERSON, R.A.F.V.R., No. 626 Sqn.
P/O. W. C. MACDONALD, R.A.F.V.R., No. 61 Sqn.
P/O. J. H. MARSTON, R.A.F.V.R., No. 101 Sqn.
P/O. H. M. C. THOMAS, R.A.F.V.R., No. 576 Sqn.
W/O. J. K. BUXTON, R.A.F.V.R., No. 83 Sqn.
W/O. R. WHALLEY, R.A.F.V.R., No. 576 Sqn.
Act. W/O. E. BARTON, R.A.F.V.R., No. 44 Sqn.
Act. W/O. J. H. TOLMAN, R.A.F.V.R., No. 83 Sqn.
Act. Flt. Lt. A. W. WALES, D.F.M., R.A.A.F., No. 460 (R.A.A.F.) Sqn.
F/O. W. R. LEE, R.A.A.F., No. 106 Sqn.
F/O. I. R. RICHARDSON, D.F.M., R.A.A.F., No. 460 (R.A.A.F.) Sqn.
P/O. A. N. DOUGLAS, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
P/O. N. A. LAMBELL, R.A.A.F., No. 576 Sqn.
P/O. L. G. MEARES, R.A.A.F., No. 51 Sqn.
P/O. C. R. BAKER, R.N.Z.A.F., No. 12 (R.N.Z.A.F.) Sqn.
Act. Wing Cdr. A. C. PEARSON, R.A.F., No. 194 Sqn.
Act. Sqn. Ldr. P. BRAY, R.A.F.O., No. 31 Sqn.
Flt. Lt. T. A. GRIFFITH, R.A.F.V.R., No. 58 Sqn.
Flt. Lt. G. A. GRUNDY, R.A.F.V.R., No. 220 Sqn.
Flt. Lt. W. HUNTER, R.A.F.V.R., No. 502 Sqn.
Flt. Lt. H. E. QUINN, R.A.F.V.R., No. 58 Sqn.
F/O. J. CARLIN, R.A.F.V.R., No. 404 (R.C.A.F.) Sqn.
F/O. L. L. HUNT, R.A.F.V.R., No. 62 Sqn.
F/O. J. L. P. PATE, R.A.F.V.R., No. 235 Sqn.
F/O. R. W. THOMSON, R.A.F.V.R., No. 248 Sqn.
F/O. W. N. WHALLEY, D.F.M., R.A.F.V.R., No. 540 Sqn.
W/O. G. S. BEST, R.A.F.V.R., No. 220 Sqn.
W/O. W. A. RIDDELL, R.A.F., No. 422 (R.C.A.F.) Sqn.
F/O. B. F. GASTON, R.A.A.F., No. 86 Sqn.
Sqn. Ldr. J. F. McD. BELL, R.C.A.F., No. 194 Sqn.
Flt. Lt. S. O. MEYER, R.C.A.F.
Flt. Lt. T. G. REID, R.C.A.F., No. 117 Sqn.
Flt. Lt. R. S. SMITH, R.C.A.F., No. 117 Sqn.
F/O. C. R. BRYERS, R.C.A.F., No. 62 Sqn.
F/O. H. R. FACEY, R.C.A.F., No. 224 Sqn.
W/O. (now P/O.) W. ANDERSON, R.N.Z.A.F., No. 53 Sqn.
Sqn. Ldr. G. J. C. HOGAN, R.A.F.O., No. 5 Sqn.
Act. Sqn. Ldr. H. G. F. LARSEN, R.A.F., No. 28 Sqn.
Act. Sqn. Ldr. G. MAY, R.A.F.V.R., No. 42 Sqn.
Act. Sqn. Ldr. A. SINGH, I.A.F., No. 1 (I.A.F.) Sqn.
F/O. P. W. HERON, R.C.A.F., No 407 (R.C.A.F.) Sqn.
F/O. J. MacL. GALBRAITH, G.M., R.A.F.V.R., No. 502 Sqn.
F/O. R. J. GARRATT, R.A.F.V.R., No. 28 Sqn.
F/O. A. MacG. PEART, R.N.Z.A.F., No. 81 Sqn.
P/O. W. BOOTH, R.A.F.V.R., No. 76 Sqn.
W/O.1 C. A. WATT, R.C.A.F., No. 23 Sqn.
Act. Sqn. Ldr. H. D. CLEVELAND, R.C.A.F., No. 418 (R.C.A.F.) Sqn.
Act. Sqn. Ldr. R. H. HARRISON, R.A.F.V.R., No. 151 Sqn.
F/O. E. P. A. HORREX, R.A.F.V.R., No. 151 Sqn.
Flt. Lt. W. A. BIRD, R.A.F.V.R., No. 605 Sqn.
Flt. Lt. B. A. BURBRIDGE, R.A.F.V.R., No. 85 Sqn.
Flt. Lt. N. S. HEAD, R.A.F.V.R., No. 96 Sqn.
F/O. A. C. ANDREWS, R.A.F.V.R., No. 96 Sqn.
F/O. P. HULETSKY, R.C.A.F., No. 418 (R.C.A.F.) Sqn.
F/O. G. N. MILLER, R.C.A.F., No. 418 (R.C.A.F.) Sqn.
F/O. W. F. E. THOMAS, R.A.F.V.R., No. 151 Sqn.
P/O. G. E. BALL, R.A.F.V.R., No. 49 Sqn.
W/O. G. D. KELSEY, R.A.F.V.R., No. 151 Sqn.
Wing Cdr. R. KINGSFORD-SMITH, R.A.A.F., No. 463 (R.A.A.F.) Sqn.
Act. Sqn. Ldr. C. I. R. ARTHUR, R.A.F.O., No. 72 Sqn.

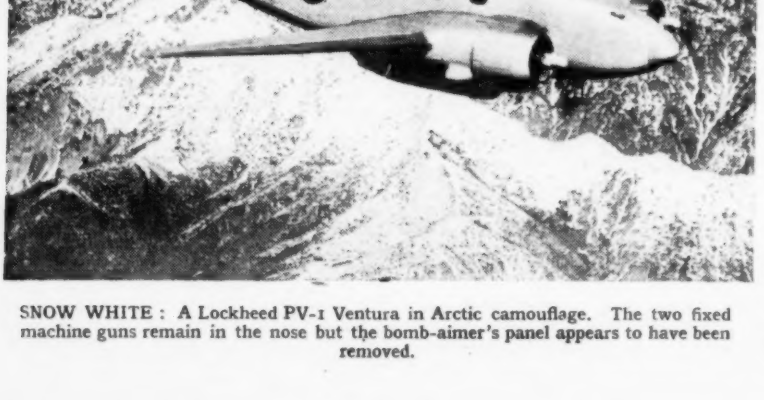
THE KING has been graciously pleased to approve the following awards in recognition of gallant and distinguished services:—

Distinguished Flying Cross

Capt. (temp. Maj.) A. K. L. STEPHENSON, Royal Regiment of Artillery.
Lt. (temp. Capt.) J. P. FOSTER, Royal Regiment of Artillery.

Distinguished Flying Medal

Flt. Sgt. C. BALDWIN, R.A.F.V.R., No. 61 Sqn.
Flt. Sgt. L. W. CROMARTY, R.A.F.V.R., No. 61 Sqn.
Flt. Sgt. A. N. DYKES, R.A.F.V.R., No. 139 Sqn.
Flt. Sgt. S. A. GRAVES, R.A.F., No. 106 Sqn.
Flt. Sgt. J. SKELTON, R.A.F.V.R., No. 207 Sqn.
Flt. Sgt. R. STANWIX, R.A.F.V.R., No. 50 Sqn.
Flt. Sgt. C. TURNER, R.A.F.V.R., No. 50 Sqn.
Sgt. C. V. L. BURTON, R.A.F.V.R., No. 625 Sqn.
Sgt. L. J. HUMMELL, R.A.F.V.R., No. 44 Sqn.
Sgt. F. M. KENNEDY, R.A.F., No. 625 Sqn.



SNOW WHITE: A Lockheed PV-1 Ventura in Arctic camouflage. The two fixed machine guns remain in the nose but the bomb-aimer's panel appears to have been removed.

Sgt. T. POWERS, R.A.F.V.R., No. 166 Sqn.
Sgt. F. H. SIMMONDS, R.A.F.V.R., No. 57 Sqn.
Sgt. J. T. WATTS, R.A.F.V.R., No. 57 Sqn.
Sgt. L. S. SUMAK, R.C.A.F., No. 576 Sqn.
Flt. Sgt. E. M. BUNN, R.A.F.V.R., No. 207 Sqn.
Flt. Sgt. J. DOUGLAS, R.A.F.V.R., No. 166 Sqn.
Flt. Sgt. G. T. A. DUNN, R.A.F.V.R., No. 166 Sqn.
Flt. Sgt. C. R. B. EVERARD, R.A.F.V.R., No. 83 Sqn.
Flt. Sgt. A. D. J. GROOMBRIDGE, R.A.F.V.R., No. 106 Sqn.
Flt. Sgt. B. C. KEMP, R.A.F.V.R., No. 139 Sqn.
Flt. Sgt. S. E. STEVENSON, R.A.F.V.R., No. 49 Sqn.
Flt. Sgt. M. C. WRIGHT, R.A.F.V.R., No. 44 Sqn.
Sgt. (now P/O.) F. J. RICKETTS, R.A.F.V.R., No. 625 Sqn.

THE KING has been graciously pleased to approve the following awards:—

O.B.E. (Mil.)

Act. Wing Cdr. J. J. BUSCH, R.N.Z.A.F.

M.B.E. (Mil.)

Act. Flt. Lt. F. DE M. HYDE, A.F.C., R.N.Z.A.F.
F/O. R. R. SMITH, R.N.Z.A.F.

Air Force Medal

Sgt. J. B. MCRAE, R.C.A.F.

B.E.M. (Mil.)

Sgt. I. W. WALTHER, R.N.Z.A.F.
Cpl. F. C. COX, R.C.A.F.

Foreign Decorations

THE KING has granted unrestricted permission for the wearing of the undermentioned decorations conferred upon the personnel indicated in recognition of valuable services rendered in connection with the war:—

Conferred by Her Majesty the Queen of the Netherlands

Commander of the Order of Orange Nassau

Wing Cdr. R. D. STEWART, R.A.F.V.R.

Officer of the Order of Orange Nassau

Act. Sqn. Ldr. J. D. G. KELLOCK, R.A.F.V.R.

Cross of Valour

F/O. J. W. STRAIN, D.F.M., R.A.F.V.R.
F/O. D. R. THOMAS, R.A.F.V.R.

Conferred by the President of the United States of America

Distinguished Flying Cross

Wing Cdr W. H. BURBURY, D.F.C., A.F.C., R.A.F.O.
Act. Wing Cdr. W. E. COLES, D.F.C., A.F.C., R.A.F.O.
Act. Wing Cdr. E. B. FIELDEN, R.A.F.V.R.
Act. Wing Cdr. A. C. PEARSON, D.F.C., R.A.F.
Act. Wing Cdr. M. L. WELLS, D.F.C., R.A.F.O.

Roll of Honour

Casualty Communiqué No. 411.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents, and natural deaths.

Of the names in this list 97 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Flt. Sgt. A. Beanlands; Flt. Lt. C. J. H. Bignell; Flt. Lt. N. Clayes, D.F.C.; W/O. H. R. Crook; F/O. F. E. Deighton; F/O. J. A. Edgar, D.F.C.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—W/O. H. Anderson; Flt. Sgt. T. K. Jones; Flt. Sgt. A. D. W. Parsons; F/O. J. M. Rankin, D.F.C.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. F. Barnes; F/O. S. Barrow; Sgt. B. Brear; Act. W/O. K. Breckon, D.F.M.; Flt. Sgt. D. J. Burge; F/O. P. Carling; Sgt. C. Chadwick; Sgt. D. Charlesworth; Flt. Sgt. J. Clarke; Sgt. J. J. Corbett; Sgt. E. C. Coward; Act. Wing Cdr. L. Crooks, D.S.O., D.F.C.; Sgt. J. Cross; Flt. Sgt. A. F. Cudd; Sgt. T. Davison; Sgt. S. R. Didsbury; Sgt. G. R. Elks; Sgt. W. S. Fletton; Sgt. P. J. Forde; Sqn. Ldr. J. N. Forrest, D.S.O., D.F.C.; Flt. Sgt. W. F. Freeze; Sgt. A. J. Gardner; Sgt. J. E. Gray; P/O. H. Green; Sgt. M. S. Grivell; Sgt. G. B. Hasdell; Sgt. J. H. Hawkins; Sgt. S. C. H. Hearn; Sgt. D. C. Hill; Sgt. J. C. Hislop;; Sgt. L. P. Howard; Sgt. W. H. Humphrey; F/O. E. Hyett; F/O. A. B. W. Illius; Sgt. J. H. Jenkins; Sgt. R. L. Jones; F/O. A. L. Kellow; Sgt. D. Kennedy; Sgt. T. M. Leonard; Sgt. D. A. Lloyd; Act. Sqn. Ldr. M. C. X. Mack; P/O. C. W. A. Manning; Sgt. H. R. Mantle; Sgt. J. E. H. Morton; Sgt. L. O. Mott; Sgt. L. Myers; F/O. R. D. B. Noble; Sgt. H. J. Oliver; Sgt. N. R. Parry; Flt. Sgt. G. Pearson; F/O. J. A. Perkins; F/O. A. R. Porter; Sgt. I. W. Pugh; Sgt. R. G. Reay; Sgt. R. J. Renton; Sgt. J. Riddell; Sgt. T. L. Rose; Sgt. L. H. Scholey; Flt. Sgt. J. F. Sedgwick; Sgt. N. Shapley; Sgt. H. H. G. Sickelmore; F/O. E. D. Skitt; Sgt. G. Smith; Sgt. P. F. Snape; Sgt. A. Stansfield; Flt. Sgt. G. H. Sutton; F/O. J. O. P. Tanner; Sgt. L. W. Thompson; Sgt. W. H. Thompson; Sgt. N. G. Tippin; F/O. S. A. Walton; Flt. Sgt. W. P. Ward; Sgt. P. A. Whitter; F/O. K. Wilson; F/O. K. J. B. Wilson.

WOUNDED OR INJURED IN ACTION.—P/O. N. H. Lloyd; Sgt. B. W. Martin; W/O. V. Wilson.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—F/O. F. Crebbin; Sgt. H. McHardie.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. W. H. T. Beattie; F/O. J. D. Cox; P/O. E. G. Harman; Sgt. M. J. Hicks; Flt. Sgt. L. E. Hopkin; Sgt. W. H. J. Mills; Sgt. R. B. Nash; Flt. Sgt. J. E. Paddison; Sgt. W. J. Penhaligon; Flt. Sgt. J. C. Rhodes; Sgt. R. G. Runyard; Sgt J. Shearer; F/O. A. R. Steeples; Flt. Lt. G. H. Wood.

MISSING.—Flt. Sgt. P. J. Adamson; Sgt. R. H. Aiano; Sgt. J. Armstrong; Flt. Sgt. L. W. J. Arnold; Sgt. R. F. Arnold; Sgt. L. V. Ashton; F/O. T. G. Atkinson; Flt. Sgt. A. E. W. Ayre; Flt. Sgt. A. R. Barber; Sgt. A. Best; Flt. Sgt. A. G. Boam; Sgt. R. J. Bond; F/O. R. F. Brailsford; W/O. A. Brown; Sgt. F. W. Brown; Flt. Sgt. E. G. Carey; Flt. Sgt. K. G. Chambers; P/O. G. J. R. Clark; Flt. Sgt. R. C. Clarke; Sgt. B. Cohen; Flt. Sgt. J. Connelly; W/O. D. H. J. Cross; Sgt. G. F. Crump; Sgt. H. Dale; Act. Wing Cdr. R. T. P. Davidson, D.F.C.; P/O. D. R. Dearman; P/O. J. H. Eastwood; Flt. Sgt. N. Elcoat; Sgt. E. Feather; Sgt. G. E. H. Flather; Sgt. B. J. Forsyth; Act. Flt. Lt. S. T. Geary, D.F.M.; Sgt. R. A. Green; Flt. Lt. D. N. Greenhalgh; Flt. Sgt. O. G. Griffiths; Flt. Sgt. G. M. Groat; Sgt. H. Harbron; Act. Flt. Lt. W. R. Hare, D.F.C.; Sgt. R. D. A. Harmsworth; Flt. Sgt. F. W. Harver; W/O. F. C. Haslam; A/C1 H. E. Haywood; Flt. Lt. W. O. Helm; W/O. J. F. Hewson; Flt. Sgt. W. T. Jones; Act. Flt. Lt. L. Joseph; F/O. R. P. N. Kayser; W/O. J. C. Kemp; Sgt. J. P. Kenny; Sgt. F. R. Kingman; Sgt. L. Kirkham; Sgt. L. V. Laight; Sgt. W. G. Lawrie; Flt. Lt. H. D. Lea; Sgt. L. A. Lewis; Flt. Sgt. M. C. E. Lewis; Sgt. D. S. Lindsay; F/O. G. McClelland, D.S.M.; W/O. E. Middleton; Sgt. H. G. Millard; P/O. W. M. E. Myers; Sgt. M. O'Connor; Sgt. R. Padgett; F/O. R. J. Ramsey; Sgt. R. Redall; Sgt. D. C. Rhodes; Sgt. V. J. D. Riddell; Sgt. R. L. Roberts; F/O. A. E. Robbins, D.F.C.; Sgt. R. C. Robinson; Flt. Sgt. D. H. Royle; F/O. J. D. Saidler; Flt. Sgt. P. A. Scott; Sgt. L. G. Smith; Sgt. T. A. Stevens; Flt. Sgt. G. J. Stoddart; Sgt. J. W. Stone; P/O. D. C. N. Sullivan; Flt. Sgt. J. A. Smith; Sgt. J. E. N. Smith; Flt. Sgt. A. W. Stein; P/O. D. R. Tait; Flt. Lt. D. E. Taylor; Sgt. J. Templeton; Flt. Lt. E. N. Thompson, D.F.C.; Sgt. S. D. Tulett; Sgt. G. D. Vine; Sgt. W. G. Walker; Flt. Sgt. S. Wallace; Sgt. G. W. Ward; P/O. J. F. Ward; P/O. L. T. Watson; Sgt. C. P. Whalley; Flt. Sgt. S. Wilson; P/O. D. A. Winterford; Sgt A. R. Wood; Flt. Sgt. C. Wray.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—W/O. R. G. Holt; L.A/C. H. Knight; Flt. Lt. H. J. Wilkinson.

KILLED ON ACTIVE SERVICE.—Flt. Lt. A. Austin, D.F.C.; F/O. L. A. Blake; F/O. D. J. Bland; F/O. J. Brown; W/O. A. E. Eid; F/O. S. G. Falconer, D.F.C., D.F.M.; Flt. Lt. W. G. Hole; L.A/C. D. D. Keay; F/O. W. Nichol; A/C.1 T. Parkinson; Flt. Sgt. T. Simister; Cpl. G. Stubbs; Act. Wing Cdr. H. C. Stumm, D.F.C.; Sgt. E. T. West; Cpl. E. G. Woodall.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. P. J. Cook; Sgt. S. P. Hawkes; Sgt. K. Kendal; Sgt. W. D. McDonald; Sgt. S. W. Wood.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Cpl. E. H. Hoez; A/C.1 A. Jagger; L.A/C. A. H. Oldridge; L.A/C. J. Shillabeer; L.A/C. R. Spatchett.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Flt. Sgt. J. C. Fowler.

DIED ON ACTIVE SERVICE.—A/C.1 G. W. R. F. Atkins; A/C.1 J. F. Balham; L.A/C. H. C. Blinman; L.A/C. J. G. Blunt; L.A/C. E. A. Brelstaff; Sgt. J. P. Curnow; Cpl. H. Dawson; L.A/C. C. F. Everett; A/C.1 R. J. Hannigan; Flt. Sgt. A. R. Hawke; A/C.1 I. E. Jones; A/C.1 J. J. Murphy; Cpl. L. G. Reynolds; A/C.1 E. C. Richards; A/C.2 E. Rourke; A/C.2 W. C. Simpkins; A/C.2 H. E. Symonds; Sgt. T. M. Thompson-Horan; Act. Flt. Lt. C. L. White; A/C.1 T. Wright.

PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED ON ACTIVE SERVICE.—Sgt. R. T Purslow.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. G. R. Adamson; Sgt. F. Jackson.

READY TO TAKE —— OFF: A reconnaissance Mustang with its F-24 camera, ready for an "op." "Sighting" is done by the white marks seen on the trailing edge.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—A/CW.1 D. M. Barron.

Royal Australian Air Force

KILLED IN ACTION.—W/O. B. M. Pritchard.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. F. C. Ebeling.

WOUNDED OR INJURED IN ACTION.—F/O. H. W. Tuck.

MISSING, BELIEVED KILLED IN ACTION.—Group Capt. J. R. Balmer, O.B.E., D.F.C.; F/O. N. T. Glenn; F/O. P. J. Hammond; F/O. J. O. Klippel; F/O. P. K. Turnot.

MISSING.—P/O. T. J. Burgess; P/O. R. J. Dobbyn; W/O. N. J. Higgins; Flt. Sgt. R. D. Kilroy; F/O. W. T. Loftus; Flt. Sgt. R. C. J. Martin; Flt. Sgt. R. G. Sauerwald; Flt. Sgt. R. Tyrell; F/O. A. P. Whitford, D.F.C.

KILLED ON ACTIVE SERVICE.—Cpl. F. E. Bullcock; L.A/C. A. Ewans; Act. Flt. Lt. W. J. McKerracher, D.F.M.; Flt. Lt. R. B. Sneddon; P/O. N. A. Wilson.

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/C. R. D. Andrews; L.A/C. R. M. Burslem; L.A/C. J. C. Lewis.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. S. J. Branch; L.A/C. E. A. Conrad; L.A/C. D. C. Haggart; L.A/C. H. A. McKay; Flt. Lt. J. D. Ward.

Royal Canadian Air Force

KILLED IN ACTION.—F/O. H. J. Young.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. L. P. Theriault.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. P. G. Williams.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW REPORTED KILLED IN ACTION.—W/O. J. E. R. Boudreault.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. H. W. Davis; F/O. L. D. Deloughry; Sgt. W. Draganiuk; Flt. Sgt. J. W. Edgar; W/O. J. D. Fiddes; P/O. J. W. Kerr; F/O. J. M. McLay; F/O. G. H. Parker.

MISSING.—F/O. L. L. Anderson, D.F.M.; W/O. G. Boucher; Sgt. P. G. Draper; P/O. H. E. Dube; P/O. D. E. Fonseca; Flt. Sgt. A. L. Gabel; P/O. D. Harrison; Flt. Sgt. R. E. Hazael; F/O. A. P. R. Holmes; F/O. W. R. Knowlton; F/O. J. W. L'Abbe; F/O. J. J. Lyng; Flt. Sgt.

SERVICE AVIATION

D. M. MacAulay; W/O. W. B. MacPherson; Flt. Lt. C. Maddin; Sgt. J. A. E. Michaud; Flt. Sgt. G. Millar; W/O. A. P. Pappajohn; Flt. Sgt. J. W. P. P. Whalen; P/O. W. E. Woodrow.

Royal New Zealand Air Force

KILLED IN ACTION.—Flt. Sgt. H. T. L. Bennett.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. S. I. Dillon; F/O. C. J. Freshney; P/O. N. R. McDonald; Flt. Sgt. J. R. Mayo; Act. Flt. Lt. R. C. C. Taylor; F/O. W. Turner.

MISSING, BELIEVED KILLED IN ACTION.—F/O. J. D. Rudling, D.F.M.

MISSING.—Flt. Sgt. J. E. Clift; P/O. A. B. Cunningham; P/O. D. S. McGregor; P/O. A. R. Speirs; F/O. J. H. Wain.

South African Air Force

MISSING, BELIEVED KILLED IN ACTION.—Lt. D. Brooksbank; Lt. M. Friedland; Lt. J. K. H. Guest; W/O. J. V. Hamilton; W/O. F. Rice; Lt. W. F. Wells.

MISSING.—2/Lt. W. C. Carter; W/O. Daleski; 2/Lt. A. S. Hogden; Lt. C. D. Sumner; 2/Lt. P. J. C. W. Watteyne; 2/Lt. White.

KILLED ON ACTIVE SERVICE.—Lt. D. Lovat; Lt. W. P. Moore; Lt. H. H. Wallace.

Casualty Communiqué No. 412.

Of the names in this list, 101 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—F/O. A. J. Baldwin, D.F.M.; Sgt. E. J. Fancy; Sgt. G. H. Holmes; F/O. B. E. Knight; Sgt. J. D. Mayger; Sgt. A. R. Muir; Sgt. D. Randle; Flt. Sgt. J. L. Shell; Flt. Sgt. N. Sinclair-Hill.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. K. A. G. Ayling; Sgt. F. J. Brown; Flt. Sgt. T. C. Foster; Sgt. G. W. Moss; P/O. F. Norris; Sgt. A. E. G. Price; W/O. E. L. Watts.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. K. A. Adams; F/O. K. Albiston; Sgt. G. F. Allison; Sgt. J. G. Barrett; Sgt. F. L. Beeston; Sgt. D. W. Bettinson; Sgt. G. Blyth; Sgt. F. Boles; P/O. J. F. Broadbent; P/O. A. Burns; Sgt. K. M. Campbell; F/O. G. R. Carpenter; Sgt. S. Chapman; Sgt. R. J. Cheadle; W/O. R. Dash; Sgt. W. S. Davies; Sgt. G. A. Davies; Sgt. A. Dixon; Sgt. J. Francis; Sgt. T. T. B. Francis; Sgt. E. G. O. French, D.F.M.; Sgt. R. K. Garment; Flt. Lt. C. V. J. Geary; Sgt. R. Gough; Sgt. M. L. Green; Sgt. D. G. Griffiths; Act. Sqn. Ldr. P. A. Haggarty; Sgt. J. Harman; Sqn. Ldr. P. N. Harris, D.F.C.; Sgt. J. B. Harrison; Sgt. S. G. B. Hayes; Sgt. J. H. Hicks; Sgt. G. Hood; Sgt. D. A. Horsley; P/O. A. G. Innes; Sgt. R. S. Johnson; F/O. M. Lloyd; Sgt. J. E. Lovewell; Act. Sqn. Ldr. K. Mathews; Sgt. R. Matthews; Sgt. N. H. Morris; F/O. H. A. Nock; P/O. F. O'Carroll; F/O. C. F. O'Connell; P/O. G. E. Parkes; Sgt. T. K. P. Peters; P/O. H. N. Pritchard; Sgt. R. Puddle; Sgt. L. E. Scarisbrick; P/O. P. J. Shearman; Sgt. C. M. Sibbald; F/O. W. R. Simpson; Flt. Sgt. W. F. Speedie, D.F.M.; Sgt. D. A. Stevenson; Sgt. G. C. Stolberg; Sgt. J. S. Thomson; Sqn. Ldr. L. T. Wallis; Sgt. J. D. Walton; Sgt. C. Weddell; P/O. A. N. Whitaker; Sgt. R. O. Williamson; Sgt. R. Wilks; Sgt. F. Willets; Sgt. L. E. Yarnall.

WOUNDED OR INJURED IN ACTION.—F/O. M. A. W. Baker; Sgt. H. L. Dyson; Flt. Sgt. C. S. Headley; Sgt. R. I. Hudson; P/O. E. F. J. King; Sgt. F. P. Robinson.

PREVIOUSLY REPORTED WOUNDED OR INJURED IN ACTION, NOW REPORTED DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. D. E. Stewart.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. F. J. Arbon; Sgt. P. J. Daw; Flt. Sgt. G. R. French; Flt. Sgt. G. K. Gritty; Sgt. J. W. Higdon; Flt. Sgt. J. Oxenburgh; Sgt. S. R. Russell; P/O. G. J. L. Smith.

MISSING.—Sgt. P. J. Adshead; Act. Flt. Lt. C. A. L. Allen; Flt. Sgt. H. G. Andrews; P/O. A. J. T. Armon; P/O. A. A. Bell; Sgt. D. N. Bell; Act. Wing Cdr. R. K. F. Bell-Irving; P/O. C. A. Bishop; Sgt. C. J. Boreham; Sgt. F. E. Bowler; Act. Sqn. Ldr. M. I. Boyle, D.F.C.; Sgt. J. T. H. Burton; Flt. Sgt. M. P. Butler; Flt. Sgt. E. G. Cass; Sgt. J. Chandler; Sgt. E. H. Charlton; W/O. S. Clarke; Sgt. R. Claxton; Flt. Sgt. D. B. Cooper; P/O. A. T. Cox; Sgt. D. B. Cox; Sgt. L. W. Cox; Sgt. R. D. Crook; Flt. Sgt. A. W. C. Darby; F/O. P. G. Davis; Sgt. A. Davison; P/O. H. Dixon; Sgt. C. Duerden; Sgt. H. E. Dyerson; W/O. I. A. Edwards; Sgt. G. A. Elliott; Sgt. R. Ellis; Sgt. J. C. Fell; Sgt. K. Frank; P/O. D. P. Garraway; Sgt. F. C. Gore; Sgt. W. M. Green; Sgt. H. Greenfield; P/O. G. C. Gunzi; Flt. Sgt. C. W. Hagerty; P/O. E. C. B. Harper; Sgt. T. J. C. Hartley; Sgt. H. R. Healey; F/O. A. G. Hendry; Sgt. P. Higgins; P/O. L. Holden; P/O. M. Hopkins; Flt. Sgt. J. C. H. L. Hunter; P/O. P. L. Johnson; Sgt. D. Jones; Flt. Lt. I. T. Jones; Sgt. P. N. King; Sgt. D. J. Knowles; Sgt. H. S. Langley; P/O. G. Lassey; Sgt. R. W. Laybourne; P/O. C. H. Lines; Sgt. T. K. D. Lucas; Sgt. A. S. McJannett; F/O. A. T. McKay; Act. Flt. Sgt. H. E. Martin; Sgt. N. W. C. Miller; Flt. Sgt. J. W. Mills; Flt. Sgt. K. B. Milton; Flt. Sgt. W. A. Molyneux; Sgt. B. Morgan; P/O. J. McD. Napier; F/O. G. E. Nichols; Flt. Sgt. A. L. Nichols; Sgt. J. Orbin; Sgt. D. Parkin; Sgt. E. F. Parry; F/O. V. C. Phipps; Sgt. A. Pickstone; Flt. Sgt. R. Pinkett; Sgt. S. R. Reeve; Sgt. C. G. Rhodes; Flt. Sgt. J. Ross; Sgt. R. P. Scott; P/O. F. Shepherd; Sgt. A. K. Shiels; Sgt. A. A. Snook; Flt. Sgt. C. G. Spencer; Sgt. N. J. Stockford; Sgt. H. J. Tucker; F/O. R. E. S. Twining; Sgt. L. R. Vale; Sgt. G. S. Vaughan; Flt. Sgt. J. R. Velzian; Sgt. C. Walker; P/O. H. A. Wallis; Sgt. W. T. B. Weare; Sgt. M. Webb; F/O. R. F. Weedon; Sgt. L. Wesley; Flt. Sgt. K. J. White; Sgt. H. Wild; P/O. J. H. Wilkinson; Sgt. L. H. Williams; Flt. Sgt. M. C. A. Wilmer; P/O. J. S. Woodward; Sgt. E. W. Wright; P/O. J. D. Wyn-Evans.

KILLED ON ACTIVE SERVICE.—F/O. R. Bailes; Sgt. F. Boardman; F/O. P. J. Crank; Flt. Sgt. W. J. T. Crossman; W/O. E. T. Donovan; Sgt. D. W. M. Giles; Sgt. T. A. Hutchinson; Sgt. J. Irons; Sgt. R. D. Jack; F/O. B. Jagger; Sgt. J. Jones; F/O. D. Merry; Flt. Sgt. A. G. Rowland.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Lt. J. Midwood; A/C.2 T. C. Murray.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. W. W. Chancey; Act. Sqn. Ldr. K. T. P. Terry, D.F.C.

DIED ON ACTIVE SERVICE.—L.A/C. W. H. Chadwick; A/C.2 R. McCulloch; P/O. J. McTaggart; A/C.2 A. C. Sutton; A/C.2 H. A. Tansley; L.A/C. J. Walmsley.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. E. J. T. Boardman; Sgt. E. Colwill; Flt. Sgt. J. S. Evans; W/O. J. P. Gillhespy; Flt. Sgt. V. M. Hanks; Flt. Sgt. W. C. Lawes; Act. Flt. Lt. T. P. McGarry; Act. Flt. Sgt. S. G. Murrell; Sgt. E. E. L. Richardson; Act. Wing Cdr. C. Scragg, M.B.E., A.F.C.; Sgt. A. A. Walton.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—A/CW.2 V. R. Cooke.

Royal Australian Air Force

KILLED IN ACTION.—Flt. Lt. W. J. Corbett.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. R. R. Whitaker.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. R. O. Watts.

MISSING.—Flt. Sgt. T. Mackrell; Flt. Sgt. B. Moxham; P/O. A. W. Nolan; Flt. Sgt. R. H. Osborne; Flt. Sgt. J. M. Robertson; Flt. Sgt. E. J. Ryan; Flt. Sgt. F. R. Sampson; Flt. Sgt. A. Woods.

KILLED ON ACTIVE SERVICE.—Act. Flt. Lt. J. A. Kirby, D.F.M.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. D. P. O'Donoghue.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Act. Flt. Lt. R. King, D.F.C.

Royal Canadian Air Force

KILLED IN ACTION.—W/O. R. E. H. Cameron; P/O. F. W. Gunn; W/O. M. L. McPherson; Sgt. J. R. McCrea; W/O. J. D. Spencer.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. J. R. Cornwall; P/O. J. D. Fergusson; F/O. J. P. Wheeler.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—W/O. C. P. Beairsto; F/O. E. K. Campbell; Flt. Sgt. J. A. Davie; F/O. H. G. Dickson; Flt. Sgt. D. A. Mackenzie; Flt. Sgt. P. I. McLaughlin; Sgt. D. Ross; Sgt. J. E. A. Thibaudeau.

WOUNDED OR INJURED IN ACTION.—P/O. P. G. Bockman; Sgt. W. A. Bradley; P/O. L. Ethier; W/O. G. F. MacEwen.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—P/O. W. J. Allingham; P/O. G. D. Van-Patter.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. E. F. Baldry; Sgt. H. A. Brad; W/O. J. L. E. Chartrand; Sgt. L. R. Dyment; Sgt. F. Etienne; F/O. J. E. F. Hawke; Sgt. W. S. Jones; Sgt. J. W. Lethbridge; W/O. G. McCann; P/O. J. C. McNary; F/O. L. L. Mortimer; F/O. W. K. Raby; Sgt. W. G. Stevens; P/O. G. G. Vipond; F/O. N. Vlassie; F/O. R. J. Webster.

MISSING.—W/O. M. R. Bell; Sgt. L. D. Bowden; Flt. Sgt. G. R. Boxall; W/O. L. A. Brenton; W/O. G. Bryson; F/O. C. W. C. Crowdy; Flt. Sgt. T. H. Elliott; Flt. Sgt. L. L. Feindell; Sgt. L. S. Franklin; F/O. A. H. B. Hall; Sgt. J. P. Keenan; W/O. D. G. Leask; F/O. S. M. Leslie; F/O. W. R. McClung; Flt. Sgt. P. J. B. Madore; Sgt. J. A. Moffat; Sgt. F. W. Morris; F/O. F. W. Morrison; Flt. Lt. E. Northern; Flt. Sgt. H. T. Peebles; F/O. C. R. Porter; Flt. Sgt. K. W. Priske; Flt. Sgt. F. P. M. Quinn; W/O. D. J. Setter; F/O. L. L. Smith; F/O. S. D. Taylor; P/O. N. Venber; Sgt. P. H. G. Vincent; Sgt. W. H. Young.

KILLED ON ACTIVE SERVICE.—F/O. W. W. Alexander; Sgt. H. Astrand; F/O. J. G. Clermont; Sgt. H. R. Davies; Sgt. E. J. Donnelly; Flt. Lt. W. A. Healey, D.F.C.; F/O. R. B. Idiens; P/O. C. D. McIvor; F/O. J. L. McKinnon; F/O. W. A. Pope; P/O. E. R. B. Robertson; F/O. M. T. Seabrook; F/O. N. O. Smith.

DIED ON ACTIVE SERVICE.—W/O. W. F. Palmer.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. W. R. Glen; F/O. J. McClure; Act. Flt. Lt. G. H. Rainville, D.F.M.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. R. W. Cooke; Flt. Sgt. L. H. Kaihamu.

WOUNDED OR INJURED IN ACTION.—P/O. F. L. Welford, D.F.C.

MISSING.—F/O. E. G. Blake; F/O. C. L. M. Forsyth, D.F.M.; Flt. Sgt. N. L. Foster; W/O. L. H. Lissette.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. A. R. J. Chisholm.

South African Air Force

MISSING, BELIEVED KILLED IN ACTION.—Lt. M. Rosendorf.

Indian Air Force

KILLED ON ACTIVE SERVICE.—P/O. G. Vurgese.

TAKEN: An Army officer, who flies an Auster IV, handing in his film for development. This seems about the only case where the Army does the flying while the R.A.F. does the ground work.